THE GAS JOURNAL

DECEMBER 30, 1931

Vol. 196 83rd Year No. 3580

OUR REVIEW

1931

THIS country, in common with the rest of the world, is passing through a financial, economic, and industrial crisis of unparalleled magnitude, and in the year that is now drawing to a close many disquieting features of the situation have been intensified. The material effects of long-continued depression upon a large number of our industries, both great and small, cannot be ignored, and, in conjunction with the financial disequilibrium and uncertainty which prevails both at home and abroad, have produced in many quarters a feeling of insecurity bordering in some cases upon despair. Such an attitude of mind is obviously inimical to the hopeful effort and endeavour without which recovery is impossible, and, in our view, emphasis should be laid wherever possible, not on the blackness of the cloud which overshadows us, but upon the silver lining which undoubtedly exists. After all, this country has much to be thankful for. Its position is infinitely less serious than that of many other countries, and many of its industries have demonstrated during a most difficult year their inherent strength and stability. In no case have these attributes been more marked than in that of the Gas Industry, and we feel that a brief retrospect of its activities and achievements during 1931 cannot fail to assist in restoring confidence and courage to many.

The final figures showing the amount of gas consumed during the year are not yet available, but provisional statistics indicate that, taking the country as a whole, there may be an increase of about 0·5 p.ct., for while in the North and Midlands there will be a small diminution owing to some restriction of the use of gas for industrial purposes due to prevailing conditions, in the South there will be a small but general increase.

Generally speaking, the cost of gas has remained unchanged, and the dividends paid by company undertakings have been maintained. In consequence, the faith of shareholders is unshaken, and, as we shall presently show, share values remain at a comparatively high level, and have not been subject to the fluctuations which have been so marked a feature of the share values of other commodities. This fact has not passed unnoticed by those seeking sound industrial investments, and there has been a notable amount of buying by shrewd investors of gas company stocks and shares. There has been but little unemployment in the Industry, and the good relations between employer and employed are once again clearly shown by the fact that the National Joint Industrial Council has been able, in face of difficulties, to conclude a wage agreement involving the reduction of wages in a large number of districts.

These and other eminently satisfactory results cannot be attributed only to the fact that gas is virtually a commodity of prime necessity, and therefore must be bought. They are the outcome in large measure of the progressive policy which has been pursued by the Industry for many years past, and it is interesting and instructive to note how that policy has found expression and fruition in various directions during the past year.

A Progressive Policy

THE rapid expansion in the use of gas for industrial purposes has directed attention in an ever-increasing degree to the possibilities of further development. Experience in the United States of America has shown the industrial field to be almost limitless in extent, and while progress must necessarily be slow during a period of acute industrial depression, the Gas Industry has been able to assist hard-pressed industries to keep working by supplying them with a fuel at once cheap and efficient. In addition, effective steps have been taken to ensure that when signs of revival appear gas will be able to assist in securing it in various directions. Several large undertakings possessing special and very wide knowledge of industrial needs, and of how they may best be met, have placed the fruits of their experience at the disposal of the Committees which have been set up in several districts; and it is expected that before long arrangements will have been completed for the pooling of knowledge, for the establishment of special showrooms for the display of industrial plant, and for the training of experts whose services will be available in all cases requiring special knowledge of industrial practice.

Attention has also been paid to gas lighting, and more particularly to public lighting. For, though domestic gas lighting is not, as is sometimes suggested, a back number, and is indeed gaining ground in many places, it is in the realm of street lighting that progress has been most striking. The idea which prevailed for some time that electricity should be adopted merely because of its modernity is giving place to the more rational view that the two illuminants must be judged on their merits. On that basis gas has nothing to fear, and, in consequence of tests and demonstrations, it has recently been retained or adopted in many places where

local authorities were uninfluenced by ulterior motives and were determined to secure the most efficient, reliable, and economical system available.

The display of gas lighting organized by the Industry in connection with the International Illumination Congress held in this country in the autumn played a notable part in opening the eyes, not only of those directly interested in lighting problems, but of the public generally to the wonderful results obtainable by the use of gas. Both the street lighting and the flood lighting were conspicuously effective, and the lessons to be learnt therefrom were admirably pressed home by those who presented papers on behalf of the Industry at various sessions of the Congress.

The attitude of local authorities who own their own electricity generating stations, and deem it desirable solely on that ground to resort to electricity for the lighting of the streets under their control, is more difficult to combat, but in several cases recently the Gas Industry has been able to have schemes of this kind rejected by showing that a change-over from gas to electricity would involve not only heavy capital charges, but an increased annual cost for a less efficient lighting service.

The same difficulty arises in regard to the use of gas in Council Houses, where local authorities still seek from time to time to usurp their power as landlords by forcing on their tenants the use of electricity, to the exclusion, either partial or total, of other media of heat, light, and power. The Industry has consistently opposed such action on the part of local authorities, and by arousing public opinion in the localities concerned, and in other ways, has been successful in a large number of cases in securing for tenants liberty of choice in this matter.

The recent action of the London County Council in abolishing restrictions which, though not supplying an electricity service, they had imposed upon the use of gas in their Council Houses, is a most useful precedent, and has already been followed by other authorities. The London County Council's decision was undoubtedly taken as the result of representations made by both the employers and the workers in the Gas Industry; and it is encouraging to note that the latter, in pressing the claim for fair treatment, once again showed their recognition of the fact that strong community of interest exists between the various sections of the Industry.

The policy of the Industry in regard to research and experiment followed for many years has again been actively pursued. Investigation as to the efficiency of gas manufacture in different types of plant has been conducted; problems of storage and distribution have been studied; and the search for new means of utilizing gas and for improvements in the appliances already in use has continued ceaselessly. Where improvements leading to greater efficiency and greater economy have been discovered they have been adopted, and it is true to say that consumers in general have at their command to-day not only a highly efficient gas supply, but appliances enabling them to use that supply more efficiently and in a greater number of ways than ever before.

The arrangements which have been made in the course of the year in regard to the treatment and disposal of residuals are another indication of the endeavour to secure the most profitable return possible in the interests of consumers. Markets in many cases have been, and still are, difficult, but in this respect also undertakings have been less severely hit than other industries. There has, too, been a considerable number of amalgamations during the year, with the consequent suppression of numerous small concerns. These, however well conducted, cannot in the nature of things be expected to be able to cut down costs, and withstand competition, in the way in which larger units should be able to do, and it is therefore of the utmost importance that amalgamations should be effected in all cases where greater efficiency and economy are likely to result. There are many areas in the country which appear to be in all respects suitable for the creation of large units on the lines of those now responsible for the supply of Greater London and adjoining territory.

The Industry and Legislation

It is unfortunate, particularly in view of the difficult conditions which it has to meet, that the Industry is still hampered by the needless restrictions imposed by the Gas-Works Clauses Acts of 1847 and 1871. A year ago we referred to the probable appointment of yet another Departmental Committee, and expressed the view that it might prove to be no more than a device for securing further postponement of the revision of the law. The Committee was duly appointed, but although it has been in existence for nearly a year it has not so far made any report. In view of the circumstance that the facts before them are undisputed, and that amendment of the law has been authoritatively stated to be urgent by the two previous Departmental Committees which examined the Industry's claims, the delay is inexplicable, and tends to confirm the fear we expressed a year ago. In the meantime, the national emergency resulting in the fall of the Labour Government, and the creation of a National Government to deal with the situation, will doubtless cause further delay in securing legislative effect for any recommendations which the Committee in the fulness of time may make. Obviously the present Government cannot be expected to deal in the near future with anything but urgent matters of national importance. On the other hand, as soon as these matters have been dealt with, it must take in hand the reconditioning of industry, and in the case of no industry will it find its task less difficult than in that of gas, where all that is required is a comparatively simple measure giving to undertakings freedom to adopt alternative methods of charging for gas, and further facilities for rationalization.

If enabling legislation must perforce be delayed, the boot is on the other foot so far as Departmental legislation affecting the Industry is concerned. A never-ending stream of rules and regulations relating to industrial diseases, accident prevention, safety arrangements, and other matters, constantly flows forth. Many of these are put into operation despite protests, while others are only avoided with difficulty after they have been conclusively shown to be unnecessary. Admittedly, the standard is high in the factories of this country in respect of the matters referred to, and nowhere is it higher than in gas-works, and it is surely not too much to ask that under the present difficult conditions a halt should be called. Industry has quite enough troubles to contend with already without having them added to unnecessarily.

Looking back on the past twelve months it will be seen that the Gas Industry has been able to maintain and improve the great public service for which it is responsible, and its ability to do so in face of exceptional difficulties is a splendid augury for the future.

Carbonization

Turning now to the technical developments in the Gas Industry, the dominant impression is the variety, in every branch of the Industry's work, which has marked the year 1931. In a brief review such as this, it is impracticable, as, indeed, it is undesirable, to catalogue all the new improvements in technique and processes; and our readers will understand that, in confining our comments to what appear to be the most significant features of the twelve months, we purposely suffer the sins of omission. The plan of our subsequent remarks is simple—it is to start, logically, with the raw material of carbonization, and to follow this material through to its final "destinations." Note the plural of the quoted word; more and more is it being appreciated that our Industry does not live by gas alone.

In regard to coal, then, the outstanding discussion of the year relates to the purchase of a material as free as possible from impurity. A process has been fully described which is capable of reducing the ash in coal to the inherent ash, and in our opinion the adoption of this process by the Gas Industry on a large scale would prove of the utmost benefit. Admittedly many gas undertakings are now buying their coal to specification, but the customary standards are, technically and econo-

mically, not of a high order. A useful point to bear in mind, for it brings the right focus to bear on the question, is that to " retort " the ash content of the coal supplied to British gas-works would require the equivalent of the carbonizing capacity of the Gas Light and Coke Company. The collateral advantages of clean coal need not be cited here, though we shall later refer to one most important aspect of the matter—that clean coal means clean coke.

The question of the mechanical separation of coal into vitrain, clarain, durain, and fusain has excited some interest. That the subject is being taken up seriously in Germany is indicated by the fact that a number of the leading coal dressing plant concerns have adopted petrographic separation, and intend to construct plants at various strategic centres. One worker on the subject in this country has arrived at the startling conclusion that fusain is a valuable constituent of a coking slack, and that high volatile coal should be treated to conserve fusain for use in the coking slack. The suggestion is that the smallest sizes of dust should be screened out of the coal before it is washed, and that the dust produced during screening should be collected. Then the dry dust, rich in fusain, may be added in definite proportions to the coking slack and uniformly mixed. In this regard, however, it is necessary to proceed cautiously. It would be very dangerous to run away with the idea that the addition of fusain *per se* is recommended as an undoubted improvement. The quantity of fusain added, for example, should not exceed a maximum of 5 p.ct.—a very different proposition from allowing the addition at random of all the free coal dust produced from any particular seam. Another investigator suggests that the vitrain fraction is best adapted for coke manufacture, and the clarain-durain fraction for retorting, gas manufacture, hydrogenation, and blending with highly swelling coals. The fusain can be directly applied for powdered fuel firing or as a raw material for colloidal fuel.

As to carbonizing plant, the notable event has been the information rendered available on intermittent vertical chamber ovens. This year we have had three exhaustive papers on this system of gas-making. All the accounts confirm the fact that intermittent vertical chamber ovens constitute an economical and highly flexible carbonizing plant for undertakings both large and small, and are most suitable for treating Durham coals. We regard chamber ovens as one of the most important technical developments in the Gas Industry of this country during recent years. The engineer to-day has at his disposal four types of gas-making plant, one or other of which is suited to the particular requirements of any undertaking. The question as to what combustion temperatures it is best to adopt must to an extent be governed by local conditions; but it would appear from the evidence that, provided the life of the plant is not seriously affected, the higher the temperature of the combustion chambers the better. The higher the temperatures, the greater the steaming efficiency; and with Durham coals we have yet to discover a carbonizing unit more capable of being steamed than is the intermittent vertical chamber oven. The gaseous thermal output of a plant producing gas of a calorific value in the neighbourhood of 500 B.Th.U. depends upon the amount of dilution which can be effected in the plant; and the extent of dilution possible in the chamber oven treating Durham coals is high.

During the year, it is almost unnecessary to say, progress has been effected in both vertical and horizontal systems of carbonization, and in water gas production; and we have had at least two highly interesting accounts of entirely new gas-works employing horizontal retorts. Particular attention has been given, by both Senior and Junior Associations, to the subject of diluting straight coal gas. The practice, which is common in several small works, of reducing the calorific value by pulling on the retorts is to be deprecated in that it is impossible to afford the consumer the supply which he requires—gas of constant quality and gravity. Also, one must consider the damage done to refractory materials by pulling, and its general effect on working results and the life of the setting. The alternatives are three—the addition of water gas, produced either in an external plant or by steaming, of producer gas generated internally or externally, or of flue gas. From the point of view of inerts, water gas, of course, holds the most favourable position, but many favour the addition of producer gas on the score of cost. Advocates of the use of producer gas from producers utilized for heating the settings put forward as advantages low capital cost of the installation, saving in labour, and very small cost of repairs and maintenance. On the other hand, advocates of external producers point out that in this way the diluent is of constant calorific value and specific gravity, and the plant can be easily controlled and is capable of meeting irregular demands. The calorific value of gas which should be distributed ought closely to approach the highest value which can be the most economically and at the same time consistently produced. To distribute (say) 20 p.ct. more volume to perform the service required by the consumer can only be justified if the saving in cost of production outweighs the increased standing and maintenance charges which arise in consequence of the larger mains, services, and meters which ought to be provided, and upon the increased capacity required of works subsidiary plant. On this matter of dilution, the flexibility of the continuous vertical retort and also the intermittent chamber oven has been well demonstrated during the year.

Coke

We have already emphasized the importance, in general, of carbonizing clean coal. A highly valuable series of practical tests on the production of clean coke was carried out in 1931. These tests will, we hope, give a lead to those in the Gas Industry who, appreciative of the potentialities of high-temperature coke in both the industrial and domestic markets—particularly the latter—are doing their best to cultivate the satisfaction of the consumer. As in gas supply, so in coke supply, it is essential that uniformity of a good product should be maintained; and it is difficult to see how coke sales can be properly developed unless there is strict control of the ash content of the coal from which it is made, and of the moisture content of the smokeless fuel delivered into consumers' cellars. We believe there exists a ready market for the sale of a solid smokeless fuel, produced at high carbonizing temperatures by the normal gas-works plant, at a price higher than that obtaining for " ordinary " gas-works coke. We feel sure that the public would be glad to pay an extra price once having experienced the advantages of a coke of very low ash content. The sale of a coke of minimum ash content would enormously strengthen the position of our Industry. During the year certain undertakings have made much progress towards this ideal, but the fact remains that to-day great discredit is brought upon the coke market in general, and the Gas Industry in particular, by those undertakings who remain content to supply coke containing a large percentage of ash and indiscriminately quenched. Wet coke is not a pleasant fuel for the domestic open firegrate; it is certainly an extremely expensive one. If a consumer is introduced to wet coke, his introduction is more often than not also his farewell to gas-works coke for this purpose.

There has been plenty of proof during the year that correct grading of coke is of the utmost importance to its satisfactory use. Many suggest that this is of even greater importance than ash content. The lesson has, we think, been learnt that, if we are to expand the sales of gas coke as they can be expanded, it is imperative that proper attention should be paid to coke sizing. More than one authority on the subject has expressed the view that sooner or later—and the sooner the better—we shall have to standardize gradings throughout the country, and to adhere to some standard of quality. Specialized sales organization on a national basis has been envisaged; and we believe that some such organization will have to be brought into being before long. And in this regard the consensus of informed opinion is that collaboration is desirable between the Gas Industry and the producers of oven coke. Then there is the question

of coke salesmanship. More interest has been generally displayed in featuring coke in showrooms and at exhibitions; and we were glad to note a recent plea for the employment of coke salesmen by all gas undertakings having an output of over 150 million c.ft.

The question of coke sales is bound up with the use of coke for heating the settings, and in this respect we have had much information during the year. A large percentage of breeze can now be employed in step-grate producers, and it has to be remembered that for every ton of breeze used in this way, a ton of coke is rendered available for marketing. There has also been ample testimony to the efficacy of cultivating small sales of coke and giving a first-class after-service to the domestic consumer, all of which points to the pressing need for more coke salesmen. Perhaps 1932 will see an improvement. We believe that a really active and intelligently conducted sales policy to induce the householder to substitute coke for raw coal would soon lead to a demand far greater than the supply.

Liquid Products

Work has continued on the utilization of creosote as an enriching agent in carburetted water gas manufacture. It has been shown, both by research and by large-scale experiment, that creosote can be used in this manner, yielding 0·75 therm per gallon. Such a course is not, however, a commercial proposition with the prices of gas oils as they are to-day and as they are likely to remain. Research during the year has demonstrated that there are at least three alternative methods of marketing creosote. First, it can be used in Diesel engines—a potential market open to every tar distiller. Secondly, in the internal combustion engine of the spark ignition type, creosote possesses a very definite advantage over petroleum oil in its anti-knock properties. Many omnibuses are now running on a creosote-naphtha mixture. Starting-up the engine is effected in the normal way by petrol; and then the petrol is turned off and the oil turned on. Extensive trials have proved that the oil is eminently satisfactory for motor traction work; because of its high flash-point, it is pre-eminently safe to use, and, owing to its composition, the exhaust gases are almost free from carbon monoxide. Actual tests on the exhaust gases of two 'buses, one running on petrol and the other on the washed tar oil, showed that, whereas the carbon monoxide content with petrol was 4·2 p.ct., with the tar oil it was only 0·3 p.ct. The only expense involved in the conversion of petrol engines for use with tar oil is the provision of an additional carburettor, a manifold, and a fuel tank. The production cost of the creosote-naphtha mixture is given as 4d. a gallon; and it is significant that several foreign countries are taking an active interest in the new project.

Thirdly, there are the possibilities of hydrogenation, a national question which has been discussed at great length this year. There is a cry for smokeless fuels; and carbonization is the method to produce them. Replacement of raw coal, though it might not materially affect employment in the mines immediately, would effect enormous economies in civic expenditure, would enhance health, and would conserve national resources. Tars in greater quantity would be produced; and if these tars, instead of raw coal, were subjected to hydrogenation, the nation would, of course, become more self-supporting. In any consideration of hydrogenation, this aspect of the matter ought not to be lightly dismissed. Also it should not be forgotten that hydrogenation does not necessarily imply the production of petrol; heavy oils can be produced by hydrogenation just as easily as the more volatile qualities. Such emphasis has been laid on the use of coal as the raw material for hydrogenation that there is danger that sight may be lost of the fact that tar oils are much easier to hydrogenate than coal. First of all there is the mechanical advantage of handling a liquid rather than a paste of coal and tar at the very high pressure involved. Then, considering that hydrogen is such an important factor in the cost of the process, it is important to bear in mind that tar oil such as creosote requires only one-half as much hydrogen as does coal. As was pointed out at the Research Meeting of the Institution of Gas Engineers, we possess the most suitable raw material which exists in quantity to-day. We also have the potential sources of hydrogen, and we can use the methane and other rich gases which are a bye-product from the process as a substitute for gas oil in the enrichment of water gas.

The possibilities of hydrogenation, then, are attractive, but sight must not be lost of the fact that there is at hand a proved method of manufacturing motor spirit from coal by high-temperature carbonization. Events of the year have rendered benzole washing a better paying proposition, and we confess to some surprise that there has apparently been such reluctance to adopt the process, though progress has admittedly been made. There is ample evidence of the financial advantages of benzole recovery. Gas undertakings which are washing for benzole are not doing so from purely philanthropic motives. We feel that, if all the advantages—both direct and indirect—of benzole washing cited by authorities during the past year were fully assessed, more benzole recovery would be practised. An advantage of benzole washing seldom mentioned is that it forms an excellent means by which to " dilute " coal gas. Again, there is the question of gum formation on the district (and such " gumming " has assumed a larger significance owing to the increasing employment of thermostatic control and governing of gas appliances). Here, too, as far as we can gather, benzole recovery is helpful, for there is testimony that those undertakings who are distributing debenzolized gas are freer from naphthalene and gum stoppages than are the majority who do not remove benzole from the gas. Also, from the Gas Industry's point of view there is advantage to be gained in competition with electricity where arrangements can be made for a local sale of benzole which will favour motor traction in place of electric traction.

In considering liquid products, we finally come to tar. There can be no question that upon the correct application of the tar and aggregate public opinion regarding the merits or otherwise of gas-works tar as a road-making or surfacing material will be largely based; and those responsible for the sale of tar for road purposes ought to be in a position to offer advice to surveyors. Research work during the year has demonstrated what an excellent material gas-works tar is, if it is used with discretion and understanding of its properties. It has been shown that the quantity of tar used in relation to the amount and nature of the aggregate far outweighs in importance the other factors such as the consistency of the tar and the temperature of its application.

Utilization of Gas

The foregoing is by no means an exhaustive account of what has taken place during the year; it is merely an impression of the " high lights." Before turning to the utilization of the Industry's main product, however, reference must be made to two novel processes—that is, novel as far as the Gas Industry is concerned—which have been introduced into this country and described during the year. The first is the semi-direct recovery of ammonia; the second the recovery of tar acids from ammoniacal liquor.

Useful suggestions have been made, which we hope will be acted upon, that the Gas Industry ought to include at once in its research programme investigations into the use of gas industrially. In a year of grave industrial depression, the Industry has done excellent work. It is becoming more appreciated that in practically all industrial processes heat plays a far greater part than power, and that gaseous heat, because of its dependability, its uniformity, its cleanliness, and the ease with which it can be controlled, coupled with its over-all economy, is the heat that the engineer wants. There has been plenty of proof during the last twelve months that, owing to the high efficiency with which town gas can be applied, its use is extending rapidly in industry for large-scale work as well as for small-scale operations. As has been pointed out, there are several industries in connection with which, at first sight, it would appear

that town gas would be too costly a fuel to employ, but where, after a closer study of the economics of fuel application, it has been found that gas can be applied with considerable saving. The point to bear in mind is that the true cost of heat application involves not only the cost of the fuel itself, with its attendant charges, but also the cost of all material damaged or scrapped consequent on imperfect heat treatment.

Particular attention has rightly been directed to building up industrial loads in areas where a year or two ago such sales would have been left to look after themselves. It is being realized that every step tending towards satisfactory utilization of gas in industry, however small the present consumption may be, will inevitably lead to future development, probably through most unexpected avenues. More faith is being placed in the outcome of persistent effort to interest small industrialists and small traders in the application of gas. There is a quarter of a century's experience and specialization behind successful industrial gas loads, and this experience is available to every undertaking.

Coming to the use of gas in the home, 1931 has witnessed a remarkable addition to our knowledge of gaseous combustion. In regard to the products of combustion from gas appliances, we can now challenge the criticism of the whole world—the medical, hygienic, and many other interests which at once suggest themselves to our minds. We can put plainly before the public, with absolute conviction, that the quantities of injurious substances present in the products of combustion of gas in ordinary circumstances cannot be regarded as of any serious consequence or of any danger whatever. Both carbon monoxide and oxides of nitrogen have been investigated during the year. Particularly interesting and important are the results contained in a "private" report—a commendable innovation—presented at the Research Meeting of the Institution, which brings together in generalized form the results of combustion tests on 400 appliances of various types. It is clearly shown how hygienic freedom from carbon monoxide can be ensured. The findings are of such practical value that we offer no excuse for epitomizing them in a review of the Industry's work in 1931: In regard to the appliance, the provision of adequate air entering, combustion space, and flueways, together with correct burner design, in relation to the desired gas rate. This rate must govern claims regarding heat input and efficiency. The workmanship employed and the materials used must be such as to maintain the critical dimensions of the original design during production and use. As to installation, this demands the correct assembly of the appliance, proper adjustment of gas rate and burner aeration, and correct flue equipment. In regard to operation, there must be control of local pressure variations, to avoid excessive gas rate or lighting-back; and adequate maintenance is necessary.

Of all phases of gas utilization, however, none has received more publicity than street lighting, which constitutes one of the finest advertisements for our Industry, provided this lighting is effective; and it is obviously desirable that the prices charged for gas for this purpose should be as low as possible. This was emphasized at the Research Meeting of the Institution, when many practical hints were put forward to help gas undertakings, at small cost, to improve their street lighting installations. Chief among these suggestions was increase in the mounting height of the light sources, and the employment of directional devices to prevent waste of useful light. The B.E.S.A. Street Lighting Specification, revised during the year, has brought about much improvement in street lighting generally, though there are several points in connection with the Specification which have given rise to a great deal of discussion, one of them being the method of evaluating installations on the basis of the minimum illumination value of the midway point between adjacent lamp columns. Another matter which is of the greatest interest to the Gas Industry is the depreciation allowed by the Specification—a factor of 50 p.ct. In this respect gas is far superior to electricity, and this should be emphasized when street lighting installations are under consideration. The Gas Industry does not require such a high depreciation factor.

There have been many developments in domestic gas appliances of all types. It is difficult to single out for special mention these improvements, but at least two achievements, to our mind, stand out. The first is a new gas fire which employs semi-luminous flames and emits a greatly increased amount of short infra-red energy; the second is the development of gas as a therapeutic agent. By means of clinical gas apparatus several cases of chronic rheumatism have been treated, with resulting alleviation of pain and improvement of joints. These appliances can be used safely in the home and are cheap, and they add still further to the variety of applications of gas. Finally, we are glad that more effort has been exercised during the year, with a good measure of success, to build up a gas refrigeration load, though we hope that in the New Year this effort will be extended.

Coal

Once more the raw material of the Industry has been a source of anxiety to those in executive control. The menace of interrupted supplies has scarcely ever been absent from us during the last 20 years, and the constantly recurring quarrels between the colliery owners and the miners have cost the Gas Industry vast sums of money.

The full effects of the Coal Mines Act passed by the late Government have probably not yet been felt, but as the Act has now been in operation for a year it is possible to write with some experience of it. The views of colliery owners as to its merits appear to vary, according to their individual circumstances, between lukewarm approval of some of its provisions and open hostility; but on the whole it has not given satisfaction to them or the miners, nor has it made more remote the possibility of future troubles arising between them. No machinery has been initiated which will bring new ideas and fresh brains to compose this ancient feud, which will certainly flame up again into open warfare when the time is propitious; and as the Act has resulted in an all-round increase in coal prices for the home trade, it is safe to say that it has caused great dissatisfaction throughout the country. The dissatisfaction centres round two provisions of the Act—those under which the colliery owners are compelled to limit their output of coal and are themselves authorized to fix minimum prices for each class of coal, and may vary these prices as and when they think fit. It may be useful therefore to state briefly how these provisions operate.

A Central Committee sitting in London estimates quarterly the probable total demand for coal, and then sends down to each district a tonnage figure of production for the ensuing three months. This tonnage figure is received and considered in the district by another Committee, which allots to each colliery in the district a quota production for that period. It should be stated that when the Act was passed each district was asked to select a period of standard output—that is to say, a period when the output of that district could be considered to be normal. When the District Committee, therefore, receives its figure for tonnage production during the ensuing quarter it allots to all the collieries in that district a quota which is a percentage of the standard period and may be 60, 70, 80, or more per cent. of it. No colliery may exceed its quota under a penalty which varies between 2s. 6d. and 3s. per ton for each ton raised in excess of its allotment, although in some districts a margin of 1 or 2 p.ct. is permitted. If, however, any colliery which has its coal well sold wishes to exceed its quota it may, if it can, arrange for the transference by purchase or otherwise of a portion of the quota of any other colliery in the same district which is not producing up to its full allotment. It should be further stated that should any extra demand arise which has not been foreseen by the Central or District Committee, the Act is sufficiently elastic to allow of the quota being reconsidered at any time during the quarter.

Now no industry can prosper if it is continually, or even periodically, producing more than it can sell at an economic price, and unfortunately we, and many other coal producing countries of the world, have been doing

this from time to time during the last ten years. The new Coal Mines Act therefore seeks to limit the output of coal in this country to the probable demand, and the Government who were responsible for it further said in effect: "The coal industry of this country is a national asset, and coal consumers should be asked to provide a reasonable return to those who supply the capital for it and a 7½-hour day at fair wages to the miner. So as to ensure these major conditions, we empower the colliery owners to establish minimum prices, below which it shall be illegal to sell coal at home and abroad." All this looks innocent enough until its implications are considered.

The first difficulty was that coal could not be sold abroad except at world prices, and the minimum prices for export have to be fixed accordingly, to which the Government replied in effect: "If coal has to be sold abroad at a loss, the home consumer must pay for it by increased prices." They were, as a matter of fact, only prevented in the last stages of the passage of the Bill from authorizing the colliery owners to levy a toll on coal sold for home consumption for the purpose of providing a subsidy for the export trade.

The sponsors of the Bill during its passage through Parliament further stated that it was unfair that the large public utility undertakings and railway companies of the country should be able to buy coal under the cost of production, the inference being that they had constantly and systematically been able to do so. Anyone who has been concerned with coal purchases in the Gas Industry knows that this is untrue. Whatever jealousies existed among the producers of coal, there was always sufficient cohesion and exchange of views between them to prevent contracts being made under the market price. Moreover, large quantities of coal have always been supplied to the Industry through merchants who buy, or have an option to buy, this coal from colliery companies who have no knowledge of its destination; and it is notorious that such merchants could always obtain better terms from the colliery owners than the latter were willing to offer directly to gas undertakings. But the effect of such statements, when made by Cabinet Ministers and emphasized by Act of Parliament for the purpose of preventing the supposed injustice, is difficult to remove, and as the passage of the Act has been followed by an increase in the price of coal to the Gas Industry incommensurate with the increased cost of production under the Act, it would appear that the colliery owners have made good use of the lead which was given to them; for it should be clearly understood that, although the Board of Trade has a sort of watching brief and there is in each district a Committee of Investigation for the protection of consumers, the working of the Act has been handed over to the colliery owners. A Committee of their number draws up a secret and confidential list of minimum prices which shall be charged for all classes of coal, and naturally these prices are designed to give all collieries, whatever their geographical position and however inefficient they may be, a chance to compete in the market. Under such a system cases of discrimination and unfairness are bound to creep in. One instance will suffice to indicate this.

Very little coking coal is used by gas undertakings and most of the coke ovens in this country are owned by the collieries. The minimum price of coking coal is considerably less than that of a gas coal. Large quantities of coking coal are transferred to the colliery coke ovens, and the coke and other residual products are able to compete therefore on very favourable terms with those produced by the gas undertakings.

As compared with the export trade, gas undertakings at present are paying approximately from 1s. 6d. to 1s. 9d. per ton more at the pit for their coal than the foreigner, and as it appears probable that in the near future the home industries will be protected from imported manufactured goods the public utility undertakings of the country will be called upon to make good the losses of the collieries on the cheap coal supplied to foreign manufacturers.

Reference has been made to the quota system and its purpose of checking over-production, but as applied under the Act the principle is thoroughly bad. Practically all unwrought coal has been given a capital value, and however inefficient the colliery or difficult to work its coal may be, it is entitled to receive its quota, at its cost of production goes to make up the average c in the district. As a consequence efficiently mana and up-to-date collieries with good thick seams are working the same time as old and inefficient ones. Whe it is understood that the loss of one working day a wee increases the whole cost of production by at least 1s. per ton it will readily be seen how much the quota system has put up the average cost of production. It did not, of course, suit the miner Members of Parliament to legislate for the shutting-down of uneconomic pits and concentrating production in the efficient and most up-to-date ones. Their policy was to find employment for as many miners as possible regardless of the economy of their labour, and while this policy is pursued the burden of the losses involved must be borne by the home consumer.

Another extremely irritating feature of the system so far as gas undertakings are concerned is the difficulty of obtaining good and regular supplies of suitable coal. Very few undertakings use only one class of coal, and most large works—especially those with vertical retorts—must have their proper blend of coal if works operations are to run smoothly and efficiently and their obligations to consumers of gas and coke are to be fulfilled. It is understood that works which obtain their coal from the Midland and Yorkshire districts have been put to considerable inconvenience in this respect, while undertakings which own their own wagons have experienced much trouble and incurred serious losses owing to bad running.

A survey of the whole position unfortunately leaves one with the distinct impression that the implications of the new Act have not been taken seriously and protested against as vigorously by the Gas Industry as they should have been. A large and increasing coal account will inevitably mean the postponement of urgent replacements and schemes of modernization or an increase in the price of gas, and very few undertakings are in a position to face with equanimity the latter alternative at the present time. Unless the widely held opinion that the Gas Industry will accept the inconveniences of the quota system and can pass on to the consumer their increased costs under the Act is vigorously combatted, the mutually helpful and happy relations which have hitherto existed between the industries will be threatened.

Bye-Products

DURING the year further plant for the production of synthetic sulphate of ammonia has come into being of a total capacity of approximately half-a-million tons of nitrogen, and the potential world output of synthetic and bye-product nitrogen now amounts to three million tons. The chief increases in plant have been in the U.S.A. (where the Government plant has now come into partial operation), Canada, and Japan. The Canadian plant situated at Trail, British Columbia, is of some interest as showing the factors which may come into play under modern conditions. At Trail is situated a large smelter producing lead and zinc, and in this process sulphur dioxide is evolved in very large quantities. It has been decided, as an alternative to pollution of the atmosphere, to convert this into sulphuric acid, part of which is to be used for the production of sulphate of ammonia from synthetic ammonia produced from electrolytic hydrogen and atmospheric nitrogen. The potential production of nitrate of soda from Chili under present conditions is probably equal to another half-million tons of nitrogen, making a total of three-and-a-half million tons of nitrogen as the world's potential output from all sources.

During the early months of the year continued discussion between the European nitrogen Cartel and the Chili producers, with a view to controlling output, ended in a complete breakdown in the negotiations, resulting in an immediate break in prices, to levels at which few, if any, of the producers could have been covering expenses. During recent years, since the very large synthetic plants were erected, improvements have been effected in the synthetic process, and small makers using

coke oven gas at a low cost figure are probably the cheapest makers, especially where (as in Belgium) they have the assistance of very cheap acid at figures approaching 13s. per ton. In these cases they are probably making sulphate at about £3 per ton, and the only other makers who can approach this figure are the large bye-product makers who have their own raw materials and plant for acid production. The cost of synthetic sulphate at the largest plants is probably about £5 per ton, and even this figure has to be increased where the plants are on low output, and have, therefore, high capital charges per ton of sulphate made.

After the first break in prices, which probably represented forced selling, prices have improved somewhat, but are still unremunerative to the small bye-product makers. This point is well illustrated by the fact that during the last two years 45 p.ct. of the members of the Sulphate Federation have ceased to make sulphate. The biggest factor in bringing this about is undoubtedly the high price charged for acid.

The chief feature of the tar products market during the year has been the improved market for pitch. This has been brought about partly by the increased demands for road tar, but principally by the decreased amount of tar available for distillation to pitch and creosote. British production of tar is now about 75 p.ct. of normal, while production on the Continent of Europe is down to 50 p.ct. This has had the effect of reducing the output of pitch to such an extent that it is now being imported from America. Road tar has continued to gain ground, and it is likely that last year's record quantity will be exceeded by something like 10 p.ct. The all-important question of quality of this product continues to be the chief factor standing in the way of a 100 p.ct. use of tar on British roads. During the year a considerable business was arranged in export of road tar to France, and this provided a welcome outlet for distillers in the Southern districts.

Creosote, on the other hand, has continued to be a difficult market at dropping prices. Here the chief factor has been the largely decreased consumption and increased production in America. With the American tar production down to about 35 to 40 p.ct. of normal, as it is at present, there might be surprising alterations in these conditions, were it not for the very large stocks available and the expressed intention of the American Railroad Executives to economize in every possible way.

With the other tar products there is very little change in the conditions ruling at the end of last year. Crystal and liquid carbolic, naphthalene, and pyridine have altered little in demand or price. Motor benzole increased in price with the additional taxation on petrol, and other refined spirits have moved up in sympathy. Recently a good demand has been experienced for 90's and pure toluene, due probably to the first effects of the new import duties.

Gas Stocks and Shares

FROM a financial point of view the year has been a momentous one. The warning of troubles ahead given by the Chancellor of the Exchequer when opening his first Budget went practically unheeded, and it was not until the crisis arrived that the man in the street realized the seriousness of the position. The situation was met by the formation of a National Government, the presentation of a Supplementary Budget imposing increased taxation, and by the abandonment of the gold standard. Then followed the General Election in October, which resulted in an overwhelming majority for the National Government. During the latter half of the year, therefore, under the influence of this political and financial unrest, consequent bad trade, and uncertainty regarding the future, securities in all sections of the Stock Exchange became seriously affected, and the daily lists of falling prices made unpleasant reading for many. Holders of ordinary gas stocks and shares, however, have with few exceptions been enabled throughout this period to look with equanimity at the values of their investments, especially when comparing the stability of their holdings with the depreciations which have taken place in other markets. It is true that losses in capital value have been by no means absent, but the same can also be said of gains.

An unduly optimistic impression has been made on the public mind by the huge expenditure on the national electrification scheme—the "Grid"—and also by the State-aided propaganda of the late Government. So much so, in fact, that there are those who, biased by an electricity comp'ex, imagine that gas as an investment has passed its zenith. It is only necessary to turn to the Board of Trade Return for 1930, or to the consistent steadiness in the values of gas stocks (as shown by the table below), to remove any misapprehension of this character. The year 1930 was by no means a favourable one, yet a large number of the undertakings recorded increases in the output of gas and number of new appliances installed. Dividends were maintained and in some cases increased, and the same can be said of the interim dividends announced during the current year.

With regard to the extent to which the general financial position has affected the prices of gas stocks and shares during the year, a comparison of the present quotations of the 50 ordinary issues shown in the "JOURNAL" Stock and Share List with those ruling on the 31st of December last reveals the fact that of these 18 are higher, 12 show no change, and in 20 instances negligible falls have occurred. We give below a list of some of the largest ordinary issues, and compare the current quotations with those at the end of 1929 and 1930, and the remarkably steady level at which the majority of these prices have remained may be a revelation to those unacquainted

Ordinary Stocks.

	1929.		1930.		1931.	Increase or Decrease over 1930.
	Dividend.	Quotation. Dec. 31.	Dividend.	Quotation. Dec. 31.	Quotation. Dec. 24.	
	P.Ct.		P.Ct.			
Alliance and Dublin	7⅛	93—96	7⅛	100—105	100 - 105	..
Barnet	7	112—115	7	108—111	120—125	+ 13
Bournemouth 5 p.ct.	9	12⅞—13¼	9	14⅛—15⅛	14⅝—15⅝	+ ⅜
" "B" shares	7	12⅜—12⅝	7	12⅛—13	12—13	— ¼
Brighton and Hove 6 p.ct.	7½	113—116	7½	112—117	114—119	+ 2
" " " 5 "	6⅔	100—103	6⅔	102—105	104—107	+ 2
Bristol 5 p.ct. maximum	5	87—89*a*	5	93—94*a*	88—90*a*	— 4½
British	7½	112—117	7½	108—113	108—113	..
Cardiff	6	98—101	6	95—98	95—98	..
Commercial	6	90—95	6	95—98	92—95	— 3
Croydon sliding scale	7	104—107	7	105—108	107—110	+ 2
" maximum dividend	5	80—85	5	81—84	81—84	..
Derby	8½	118—121*b*	8½	115—125*b*	120—125*b*	+ 2½
Gas Light £1 units	5	17/9—18/3	5	19/9—20/3	17/6—18/6	— 2s.
Liverpool	6	91—92*c*	6	96—97*c*	96½—97½*c*	+ ½
Newcastle £1 units	5⅝	16/3—16/9*d*	5⅝	6/9—17/3*d*	15/9—16/9*d*	— 9d.
Portsmouth 4 p.ct.	8	113—118	8	115—120	119—124	+ 4
Sheffield	6½	104—106*e*	6½	105—107*e*	103—105*e*	— 2
South Metropolitan	6½	99—101	6½	104—108	96—99	— 8½
South Suburban	6½	101—104	6½	102—105	101—104	— 1
Southampton 5 p.ct. maximum	5	77—80	5	75—78	76—79	+ 1
Tottenham	6⅝	101—106	6⅝	103—107	103—107	..
Wandsworth	..	..	7	109—114	110—114	+ ½

Quotations at: *a* Bristol, *b* Nottingham, *c* Liverpool, *d* Newcastle, *e* Sheffield.

with the financial side of the Industry. The dividends paid for these two years are also shown in the table, and here, again, the same consistency prevails; while of the interim or half-yearly dividends announced by these undertakings this year, the only changes have been an increase of $\frac{1}{8}$ p.ct. per annum by the Tottenham Company and a decrease of $\frac{1}{2}$ p.ct. per annum in the case of the Sheffield Company.

It will be remembered that the unsatisfactory trade conditions prevailing during the greater part of 1930 militated against the investment of available funds in industrial enterprises, with the result that there was a heavy demand for gilt-edged securities, and prices increased to such an extent that the yield became unsatisfactory. Attention was then turned to other fixed-interest bearing securities, and gas preference and debenture stocks received a large measure of support. This resulted in a steady upward movement in prices, which continued up to September of this year, when these stocks were adversely affected by the general marking down of prices. Some of this depreciation has now been made good, and it will be seen by the following list of irredeemable debenture stocks that, in spite of the depression, the majority of these are now quoted at higher prices than at Dec. 31, 1929:

Debenture Stocks.

—	Quotations.		
	Dec. 31, 1929.	Dec. 31, 1930.	Dec. 24, 1931.
Alliance and Dublin 4 p.ct.	62–65	72–77	67–72
Bournemouth 4 p.ct.	71–74	75–78	73–78
Cambridge 5 p.ct.	90–93	97–100	92–97
Commercial 3 p.ct.	54–57	57–60	51–56
Gas Light 3 p.ct	56–58	60–63	52–57
Maidstone 3 p.ct.	52–55	54–57	55–60
South Metropolitan 3 p.ct.	54–57	60–63	53–58
South Suburban 5 p.ct.	92–95	98–101	92–97
Southampton 4 p.ct.	68–71	76–78	70–75
Tottenham 4 p.ct.	72–75	76–79	68–73
Wandsworth 5 p.ct.	91–95	97–100	94–99

The Year's End

THE view has been expressed above that emphasis should be laid wherever possible, not on the blackness of the cloud which overshadows us, but upon the silver lining which undoubtedly exists. There is ample ground for the claim that this brief retrospect of the activities and achievements of the Gas Industry during 1931 cannot fail to assist in restoring confidence and courage, and besides this there are hopeful indications with regard to the position of affairs generally. In the forefront of these hopeful signs we would place the fact that the eyes of everyone have been opened to the true state of things. Even the least informed no longer goes about in blinkers; and this awakening—rude though it may have been—has, from the point of view of the country's future welfare, been worth all the doses of soothing syrup in the world.

How thorough the awakening had been was seen when the country returned a National Government, with a backing of unprecedented proportions. This brought us to a turning point, from which much silver lining to the cloud could be seen. From that day at the end of October, we could look forward with fresh courage. Much is owed to those who, at this critical juncture, and sometimes at personal sacrifice, placed the welfare of the country before any other consideration, and much also is owed to the sound common-sense of the British people, who, when fully apprised of the position, had no difficulty in separating the wheat from the chaff. As we remarked at the time, the world received evidence incapable of being misconstrued that the British nation is as sound as ever it was; while for our people themselves (if purely Party considerations are allowed to remain in the background) the way has been made clear for a long period of sane finance, with all the benefits that it must bring in its train.

With a majority of something like 500 for the National Government, and the Socialists reduced practically to impotence, hopes immediately ran high, and there was some slight impatience manifested here and there because Ministers did not at once undertake Herculean tasks. Time is necessary for such big steps as are needed to put the country once more on the high road to prosperity; but these steps will be taken. Meanwhile, we have been permitted another peep at the silver lining, inasmuch as the Abnormal Importations (Customs Duties) Act is proof of a determination to adopt strong measures. Under this Act, goods in specified categories are subject to a duty of 50 p.ct. So far three Orders, each embracing a lengthy list of dutiable goods, have been issued. Among the articles included in the first Order were hearth tiles and a number of tools; while Order No. 3 subjects to duty illuminating glassware for use in connection with artificial light. In addition to this "anti-dumping" move, a special publicity campaign in the interests of British trade was launched by the Empire Marketing Board, and reports from all quarters prove the existence of a strong determination on the part of the public to purchase, where possible, British goods.

There is yet another bright spot. Since the first National Government took office, some months ago, there has been an almost continuous improvement in the unemployment figures. The gain, perhaps, has not been a startling one, but it began at a time of year when the tendency is usually in the opposite direction. At mid-December the number of wholly unemployed persons on the registers of Employment Exchanges in Great Britain was the lowest recorded since last May. In part the improvement must have been due to the recently introduced regulations for the removal of anomalies, but by no means all the gain can be so allocated, and the portion which cannot constitutes yet another bit of the silver lining—small as yet, but of happy augury, as showing that trade, in some directions at any rate, is on the mend.

With so much to the good, we feel that, in wishing our readers "A Happy New Year," there are solid grounds for believing 1932 is going to be a better year than its immediate predecessor.

Forty Years' Progress

IN the foregoing we have dealt with what appear to be the outstanding events and developments in the Gas Industry during a singularly depressed year. It is appropriate now for a moment to consider the progress effected in one broad branch of gas production since the year 1892. This branch is carburetted water gas manufacture, and the reason why we single it out for a particular comment is that the New Year marks the fortieth anniversary of a remarkable firm—Humphreys & Glasgow. The history of "H. & G." is, without any exaggeration, a romance of engineering skill and sound business policy. The reputation of this firm is an enviable one, and it has been well earned by sound workmanship, continuous experiment, and careful commercial application of new ideas. The Gas Industry knows from experience that a new improvement put forward by "H. & G." is a tested improvement.

The first successful carburetted water gas plant in Europe was started at Beckton in the winter 1890-91. To-day nearly one-sixth of the gas supplied by undertakings in Great Britain is carburetted water gas. As most of our readers are aware, "H. & G." have technical reciprocity with the U.G.I. Company and Affiliates in America, and with the Compagnie des Compteurs and Affiliates, through the Société Gaz et l'Eau, in France and the Latin States. This combination has unparalleled opportunities for gaining new knowledge for perfecting carburetted water gas plant; and full advantage is taken of them. The curve of advance of Humphreys & Glasgow takes the form of a parabola, not a straight line. To emphasize this, one has only to think of the entirely automatic water gas sets, complete with waste heat boilers, and capable of extraordinary flexibility of working in regard to both output and fuel used, now available to the Industry.

The Gas Industry is renowned for its reliability of supply of light and heat; and there have been many

occasions when this continuous service has been made possible only by the manufacture of carburetted water gas—the coal strikes of 1921 and 1926 are major examples; breakdowns of carbonizing plant constitute minor instances. And carburetted water gas plant is available to any gas undertaking, irrespective of size. The collateral advantages of carburetted water gas are many. Small ground space occupied in relation to output of gas; little wear and tear; availability (cold plant can be brought into operation within an hour or two) and flexibility; saving in storage capacity; control of the coke market; independence of labour—these are some of the features which account for the popularity of carburetted water gas. But there is one point which deserves stressing above others, for it is sometimes forgotten—that carburetted water gas plant enables coal gas plant to be worked at optimum capacity, and this at the lowest economic level, on any type of coal it is desired to carbonize.

It is, in fact, not too much to say that the Gas Industry owes much of its success to carburetted water gas; and that in this success the work of Humphreys & Glasgow on water gas, carburetted water gas, and complete gasification has played a dominant part. And the facilities which the firm are able to offer in 1932 are greater than ever.

The "Journal" Calendar and Directory

The year at the threshold of which we now stand is to be one of hard work and sustained endeavour, when all that is likely to be of assistance should prove more than usually welcome. It is with the conviction that we are offering something capable of being a real help in such circumstances that we shall during this week be forwarding to subscribers (for whom it has been prepared) the 1932 Edition of THE "GAS JOURNAL" CALENDAR AND DIRECTORY. Good as last year's Edition was generally declared to be, that for 1932 will leave it well behind. Additions and improvements will be found scattered throughout the book; no pains having been spared to make it, what we wish that it should be—the guide, philosopher, and friend of the active members of the Gas Industry, whatever may be their circumstances.

For the Engineer, notable additions include sections on "Manufacturing Costs" and "Building Materials;" for the Administrative Department, there are "General Statistics of the Industry;" for the Distribution Superintendent, information regarding the "Flow of Gas in Mains and Service Pipes;" and for the Public Lighting Department, a fuller list of officials than before. Under the heading of "Legislation," particulars have been added of the Act which gives the Sheffield Company extensive limits for the supply of coke oven gas; while the "Income-Tax and Rating Notes" have been entirely overhauled. Several additions will be noted under "Carbonization"—a remark which applies also to "Tar Distillation," where will now be found the Specification for Tar No. 3, as well as information on sampling tar. And the list of additions would be incomplete were no mention made of the considerably extended Advertisement Section. No less valuable than any other part of the Directory, this section contains many attractive lay-outs, beautifully printed on special paper. The Almanack is in much the same form as last year, and contains information as to sunrise and sunset, and lighting-up times, which is difficult to find set out conveniently elsewhere.

Fuller information has been included in the Directory portion of the book. Many subscribers urged the stating of telephone numbers, and this has been done—opportunity being taken to arrange at the same time a far more convenient lay-out. A remarkable amount of evidence is gathered here of the development of methods of charging for gas. From Australia and New Zealand we have met with greater success than hitherto in obtaining information, and cordial thanks are due to the senders. We are also much indebted to Mr. G. W. Allen, Secretary-Treasurer of the Canadian Gas Association, for an entirely new section dealing with Canada. The "Personnel" has been extended, and every effort made to secure accuracy. The list of Bye-Product Coke Oven Plants in Great Britain is repeated, as also are the exceptionally complete particulars of Gas and Allied Organizations.

Last year many found the single page devoted to the Index inadequate for what amounts practically to a short text-book on Gas Manufacture and Distribution. This year the Index has been extended, and in form to facilitate the most rapid reference. It is placed conveniently between the "Memoranda" and "Diary" sections; and in the latter ample room has been left for jottings and records.

These are the points to which we feel we should draw attention when presenting the Directory to subscribers. The views of our friends, whether they be laudatory or critical, will assist us in preparing next year's Edition.

PERSONAL

Before his departure to Nottingham, Mr. GEORGE DIXON bid farewell to the Lancaster Corporation and the Gas Department on Dec. 21, when he was the recipient of presentations from the staffs at the works, and of a grandmother's clock from the chief officials of the Council, whose tribute was voiced by the Town Clerk (Mr. R. M. Middleton). At the Town Council meeting a resolution was moved by Councillor Till (Chairman of the Watch Committee), extending to Mr. Dixon congratulations on the Nottingham appointment, and placing on record its high appreciation of the valuable services he had rendered for the past twelve years, during which he had occupied the position of Gas Engineer and Manager with ability and distinction. His term of service had been very strenuous, the works having been re-organized and modernized by the installation of the inclined chamber oven system. The Council assured Mr. Dixon that he carried away with him the knowledge that not only the Council, but the ratepayers, were unanimous in the hope that his work at Nottingham might be characterized by the same success.

Mr. ALEXANDER TRAN, Assistant Engineer and Manager, Gas-Works, Helensburgh, has been appointed to the position of Assistant Engineer and Manager at Coatbridge, in succession to Mr. Alexander Jamieson, who has been appointed Engineer and Manager at Johnstone.

We have been asked to announce the appointment of Mr. STANLEY BENNET as a Director of Messrs. Alder & Mackay, Ltd., Gas Meter Manufacturers, Edinburgh. Mr. Bennet, who is the youngest son of the late Mr. John H. Bennet, has acted as Assistant Secretary for some years, and has also controlled the Company's interests overseas.

Mr. T. HANDEL, Managing Director of the Ilminster Gas Company, and his wife celebrated their golden wedding on Christmas Eve. They are 75 and 74 years of age respectively.

Mr. NOEL S. SMITH, Distribution and Sales Superintendent to the Luton Gas Company, was presented with a gold cigarette case by the Department on leaving to take up his new position as Distribution Engineer and Sales Manager to the Bristol Gas Company. The presentation was made by Mr. Wm. Phillips, Engineer and General Manager, who paid tribute to the work Mr. Smith had done during his six years in Luton. Mr. Smith was for a number of years at Greenock and is an ex-Chairman of the Scottish Salesmen's Circle.

THE NEWS OF THE WEEK

"Promptitude."—With a view to obtaining the maximum number of gas fire orders during the period near Christmas, the Newcastle-upon-Tyne and Gateshead Gas Company inserted a notice in the local Press to the effect that gas fires ordered on one day would be fixed the following day.

Gas Production in Belgium.—The sales of gas by the Compagnie du Gaz de la Region de Charleroi, Belgium, during the financial year 1930-31 amounted to 391,176,000 c.ft. against 382,956,000 c.ft. in the preceding twelve months. The number of consumers in the district advanced during the year from 20,622 to 21,683.

The Llandudno Council have decided that seven men over sixty-five years of age, doing light work at the gas-works, be dismissed at the end of January. The Committee also decided to dispense with three men in the works department, and asked the Works Committee to consider the grading of fourteen others at a lower rate of pay.

The Tamworth Gas Light and Coke Company have during the last week been holding an exhibition of gas appliances. The exhibition was opened by the Mayoress (Mrs. W. T. Oliver), who expressed the hope that the exhibition would enable them to get the best out of the appliances they already possessed. Cooking and washing demonstrations were given during the week.

Dearer Gas for Mossley.—The Mossley Council, which recently built a £130,000 new model gas-works at Roaches, has decided to increase the price of gas by 8d. per 1000 c.ft., from 3s. 9d. to 4s. 5d. Due mainly to the abnormal amount of unemployment in the town, the consumption of gas in Mossley has gone down by 48 million c.ft. There was a loss on last year's working on the old works of £6806.

After Successful Experiments, the Mangotsfield Urban District Council, near Bristol, have installed in the main thoroughfare of the Staple Hill district an interesting and up-to-date system of gas lighting which has effected a big improvement. The old gas standards extending the whole length of High Street and Broad Street, Staple Hill, have been dispensed with, and by arrangement with the Bristol Tramways Company, the most modern gas lamps of 500 candle-power each have been suspended from the electric standards. The whole of the work was carried out by the Bristol Gas Company.

Tariff on Illuminating Glassware.

An ad valorem duty of 50 p.ct. has been imposed on illuminating glass-ware for use in connection with artificial light (other than oil lamp chimneys and miners' lamp glasses).

The imports of these articles amounted in October to 16,000 cwt., and in November to 20,000 cwt., of a value of £58,000. In 1930 the average monthly imports were 11,000 cwt.

The Salerni Process.

Members of Sheffield City Council, the Chamber of Commerce, Sheffield University, and the Cutlers' Company met at Sheffield Town Hall last week to discuss means of encouraging the industry of the low-temperature carbonization of coal to come to Sheffield. Much of the research work in connection with the Salerni process has been done at Sheffield University, and Sheffield University will have to continue to give advice, no matter where the works are situated.

The meeting sent a telegram to Commendatore Salerni expressing Sheffield's great interest in the process and the desire of the city that the new works should be established there. It was pointed out that the plant ought to be made in Sheffield, and Commendatore Salerni was informed that a representative deputation had been appointed to interview him, in Sheffield or elsewhere, to make representations in support of their views and to offer assistance and co-operation in the matter.

Extended Services at Farnham.

The Farnham Gas and Electricity Company was dealt with by the "Financial Times" in a recent "Potential Investments" column, and it was stated that the Company is nearly a century old, having been established in 1834. It was registered in 1898 as the Farnham Gas Company and incorporated by Special Act in 1910 under the present title, further powers being conferred by subsequent Acts and Orders. As from the end of 1928, the undertaking of the Alton and District Gas Company was purchased for £18,034 cash. Local authorities have power to purchase the electricity undertaking after 1952.

Gas and electricity are supplied in the urban district of Farnham and several adjoining parishes in the county of Surrey, in a number of parishes in the county borough of Southampton. With the purchase of the Alton undertaking, the statutory area now covers about 50 square miles.

Conservative Finance.

The whole of the ordinary share capital is subject to a sliding scale, whereby the dividend may be increased or reduced from the standard rate of 7 p.ct., according to the selling price of gas, being below or above the standard price. This is now 13d. per therm, and the present price charged is 11·8d. per therm. While profits for 1931 promise to be sufficient to maintain the 7½ p.ct. rate of the four previous years, the Directors have decided to adopt the more conservative figure of 7 p.ct. for the current year, in view of the general financial situation, and an interim dividend at this rate has been paid.

With the great extension of the district the demand for gas and electricity has grown considerably and rendered necessary large additions to the respective distributing systems.

1932 "Journal" Directory.

The following changes and additions are to hand since going to press:

Page 6, Bewdley. H. C. Gazely (from Woodhall Spa) appointed Engineer *vice* G. Hogg.

Page 12, Bromyard. J. Oliver, Secretary, *vice* S. Sirrell, deceased.

Page 16, Cleator Moor. Telephone, No. 4.

Page 56, Rhos. G. Hogg (from Bewdley) appointed Manager.

Page 74, Wilton. W. W. Taylor appointed Engineer and Manager *vice* W. E. Hamblin, deceased.

Page 76, Woodhall Spa. H. C. Gazely to Bewdley.

Forthcoming Engagements.

Jan. 9.—Scottish Junior Association.—Joint Meeting in Edinburgh. Address by Mr. T. M. Ashford, Senior Smoke Inspector, Glasgow.

Jan. 9.—London and Southern District Junior Association.—Visit to the Home Office Museum, London.

Jan. 9.—Western Junior Association.—Meeting in Exeter. Paper by Mr. J. H. Dyde on "Coke in Relation to its Domestic Use."

Jan. 9.—Scottish Junior Association.—Joint Meeting in Edinburgh. Address by Mr. T. M. Ashford on atmospheric pollution.

Jan. 14.—Midland Junior Association.—Paper by Mr. J. C. Cotterill, of Worcester, on "Notes on Water Softening Plants."

University of Leeds.

Programme of Special Courses for Session 1931-32.

In connection with the work of the Department of Coal Gas and Fuel Industries with Metallurgy, arrangements have been made for the delivery, during the Second Term of the Session, of the following Special Courses of Evening Lectures:

1. *The Manufacture of Coal Gas*, by Mr. T. F. E. Rhead and Mr. H. Hollings.—A course of twelve lectures divided into two sections, Carbonization Practice and Gas Purification Practice. The first section will consist of six lectures given at 6 p.m. and 7.30 p.m. on Fridays, commencing Jan. 22 and concluding Feb. 5, 1932. The second section, given by Mr. Hollings, will consist of six lectures given at 6 p.m. and 7.30 p.m. on Tuesdays, commencing Feb. 16 and concluding March 1, 1932.

2. *Refractory Materials.*—A course of eight lectures given by Prof. J. W. Cobb, on Tuesdays at 6 p.m. and 7.30 p.m., commencing Jan. 12 and concluding Feb. 2, 1932. A course of two lectures will be given by Dr. A. L. Roberts at 6 p.m. and 7.30 p.m. on Tuesday, Feb. 9, 1932.

3. *The Coke Fire.*—A course of two lectures will be given by Mr. H. J. Hodsman at 6 p.m. and 7.30 p.m. on Friday, Feb. 19, 1932.

4. *Metallurgy.*—A course of six lectures on the microscopic study of engineering alloys, followed by practical work in the laboratory, will be given by Mr. P. F. Summers, on Wednesdays, at 6 p.m., commencing Jan. 20, 1932, and concluding Feb. 24.

5. *Evening Laboratory Course.*—The laboratory of the Department will be open on Wednesday evenings between 6 p.m. and 9 p.m. from Jan. 20 to Feb. 24, 1932, for a limited number of students who have already received some chemical training, but who desire instruction in Fuel Calorimetry and Pyrometry. More advanced students, capable of independent work, may also be admitted to the laboratory during these periods.

These lectures provide a unique opportunity, not only to students taking their degree courses at the University, but also to those engaged in gas engineering and the allied industries, of hearing a systematic exposition of the subject from lecturers who can speak with authority, arising out of first-hand experience in responsible positions, concerning the most modern and scientific practice. Such lectures are regarded as indispensable for the training of students taking the full Gas Engineering course at the University, and such students are required to attend them all, and to answer questions upon them in their final examinations. But the lectures are so arranged that they can be attended also by students from outside, so as to make them of the greatest possible usefulness to the Gas Industry.

In these days when the necessity for the best possible training is insisted upon so frequently, and in so many quarters—when, for example, it is so necessary for any future member of the Institution of Gas Engineers—it might be held unnecessary to stress opportunity which attendance upon these lecture courses provides. Experience, however, shows that, although the quality and keenness of the outside students are unquestionable, as displayed by their making long journeys for the purpose of attending, the numbers are sometimes disappointing. It is to be hoped that this will be rectified by an increasing consciousness on the part of potential students of the value of the opportunity presented to them, and by an increasing measure of encouragement given by seniors to their juniors to take this opportunity.

French Roads Congress and Exhibition.

A roads congress and exhibition took place in Paris from Nov. 3 to Nov. 14. It appears from "Journal des Usines à Gaz," 1931, 55, 580-583 (Dec. 5), that road tar was well to the fore.

The stand of the Comité Central des Producteurs et Distillateurs de Goudron en France exhibited a section of a road in course of being tarred. On it were a tar spraying lorry of date 1901 and, as a contrast, a 1931 Spiros tar spraying tank car. The driver's seat of the former was occupied by a figure representing an effigy of Guglielminetti, "the father of tar." In front of the stand was a model with two cars in continual motion, one on a tarred road and one raising clouds of dust on an ordinary road. A legend was affixed, "On a tarred road driving is a pleasure; on an ordinary road there is nothing but dust." At the side of this model was a map of France clearly showing the distribution of the gas-works and the quantity of tar treated by them, as well as the distribution of coke-oven plants, glass works and factories treating tar. The stand was completed with a number of photographs and tables of statistics covering the use of tar on roads.

The Compagnies Réunies de Gaz et d'Electricité had a stand exhibiting the Guillet and the Cabrier plants for dehydrating and distilling tar for road purposes. Adjoining this was the stand of the Compagnie des Compteurs et Matériel d'Usines à Gaz showing a model of the T.I.C. tar plant. On another stand a model Wilton plant was shown.

Several papers were read during the congress. Messrs. J. Bing and M. Linckenheyl presented a report on recent progress in the preparation and use of surface dressings of tar, bitumen, and bitumen mixtures, and dealt with the historical development of the tar treatment of roads, the similarity and differences between tar and bitumen, research work carried out with a view to improving the quality of the products and for ascertaining the best methods of application, bitumen mixtures, and research work on cold spraying. Though much progress has been made, much more remains to be done, and this further work will be facilitated by the closest co-operation between tar producers, road constructors, and engineers.

M. Conche dealt with recent progress in the construction of roads with materials having a hydrocarbon basis, from the point of view of thick carpets for roads subjected to heavy traffic. Penetration methods and methods using premixed material were described, and the advantages and disadvantages of thick carpets were reviewed.

Prof. Meunier and M. Mathieu presented a paper on the physico-chemical aspects of the use of bitumen emulsions in road construction.

Hastings and St. Leonards Gas Company.

The Hastings and St. Leonards Gas Company, stated a recent issue of the "Financial Times" in its "Potential Investments" column, was incorporated by Special Act in 1854 and, in 1925, acquired the Battle Gas and Coke Company. The statutory area of supply covers about 70 square miles, including the immediate outskirts of the county borough and several adjacent parishes. The statutory standard price of gas is fixed at 16·6d. per therm and dividends are subject to the usual sliding scale.

The strike increase of 1½d. per therm was discontinued in March, 1927. A further reduction of ½d. was made in the following October, again in April, 1928, and in September, 1929, making 10d. per therm, at which it remained at the end of 1930.

"Too Smart."

Under this heading, our contemporary the "Ironmonger" draws attention "to a setback which one of the ubiquitous tool steel salesmen has received recently at the hands of a County Court Judge." In that particular instance it was a firm of builders who had suffered; but the circumstances are of wider application, for it is added that "during the past six months many builders and others all round London have been victimized in this way by one or other of the firms who practice this method of trading." We therefore reproduce the following portions of the "Ironmonger's" report of the case.

In the Southend-on-Sea County Court, on Dec. 3, before his Honour Judge Crawford, William Symons, of Rotherham Works, Little Church Street, Willesden, London, N.W., sued Iversen & Morgan, builders, of Highcliffe Road, South Benfleet, for £17 6s. 6d., balance of account for steel sold and delivered, which steel had been rejected by the defendants.

Mr. Maurice Napier, a traveller for the plaintiff, said he called on the defendants early in June last and told them he had a very good steel which he thought would interest them, and one which was much better than the average smith used for welding. The defendants inquired the price and were told it was 2s. 9d. a pound, delivered. They asked him if he sold wedges ready made up. Witness said that, as a rule, his firm sold the steel in bars, but that if the defendants wished, it could be supplied in the form of wedges with defendants' name stamped on them. The defendants said they would have three wedges. Witness then asked them if they wanted any steel for their picks. They asked how the steel was tempered, and he told them it was done by the old-fashioned way of bringing it to a cherry red and plunging it in water. The defendants ordered some of the steel for their picks and for their cold chisels. Witness read the order over to them and left them a carbon copy.

Mr. Reidar Bonde Iversen, one of the partners in the defendant firm, stated that Mr. Napier, who represented himself to be Mr. Cotton, told them that the steel was self-hardening, and that it needed no tempering at all. He said that when a pick was welded with it, all that was necessary to re-sharpen it was to heat it in a fire and hammer it out. The steel was delivered. He had a cold chisel made out of it and found it useless, as it flattened out when it was used.

Mr. Charles Henry Morgan, partner of the previous witness,

THE NEWS—*continued.*

said Mr. Napier produced a small piece of steel and said it was the finest steel in the world, and could be used for anything in the cutting line. Witness had tested a pick which had been welded with the steel and found it useless. He tried it on a piece of concrete and the end turned over.

His Honour, giving judgment, said he had come to the conclusion that Mr. Iversen had told a story which was perfectly true. To use a popular expression, the plaintiff had not "delivered the goods," and the buyers were entitled to reject what had been delivered. He found that representations were made as alleged, that those representations were untrue, that the purchasers were entitled to reject the goods, and that they did so within a reasonable time. Judgment was given for the defendants, with costs.

Mr. Hoare (for the plaintiff) said he was instructed to ask leave to appeal.

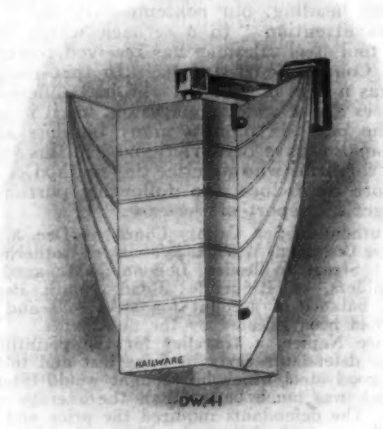
His Honour: I absolutely refuse leave to appeal. I have found these facts. I have come to the conclusion that the evidence of Mr. Napier is untrue. I do not believe him. I believe the evidence given by Mr. Iversen, that this stuff was absolutely unsuitable for the purpose for which it was sold.

NOTES ON PLANT AND PROCESSES

British-Made Glassware.

The manufacture of artistic glassware has been reduced by Messrs. Hailwood & Ackroyd, Ltd., of Morley, near Leeds, to a fine art, and each new list they bring out seems to contain a number of further attractive and tasteful designs in lighting glassware for almost every conceivable illuminating purpose and in almost every possible shape and colour.

Two new leaflets illustrating the extreme versatility of their designs of lighting fittings have recently been sent us by the firm, and, being all-British made, would seem to prove that this country is by no means behind in the production of lighting glassware suitable to the needs and the pockets of all. Among the articles dealt with are a new range of built-up pendent, wall, and ceiling panel fittings; and lantern and standards for both inside and outside work. It is mentioned that the metalwork is finished in copper bronze, nickel, oxidized silver, chromium plated, &c. A range of most beautiful fittings in actual colours is illustrated on the first two pages of one leaflet, a typical example of one of which is shown in the accompanying photograph. The glassware consists of the firm's three-ply and "Moon Halo" satin finishes.



An Attractive Example of "Hailware" Wall Bracket Fitting.

Details are also given of fittings suitable for hall lights and desk standards, while a number of very attractive fittings are shown for outdoor standards, ornamental lighting, &c. Another of the firm's lines is the manufacture of large-size glassware for panels, staircases, entrances, &c., examples being illustrated of staircase balustrades with illuminated hand-rails built up of "U" shaped channel sections of glass and metalwork of bronze, rustless steel, or any other finish. Illuminated balcony, platform fronts, and pillars are also manufactured by Messrs. Hailwood & Ackroyd to almost any design a customer may require.

The other leaflet illustrates some of the firm's latest designs of carved art panels, bowls, and globes. These panels and globes also can be built up into a large variety of charming fittings to suit individual tastes; and the firm will also work to architects' designs and specifications.

A Celebration at Chesterfield.

The First Annual Supper of the employees of the Chesterfield Corporation Gas Department was held on Monday, Dec. 21, at the Picture House Café, Chesterfield, when sixty-six sat down to an appetizing meal under the Chairmanship of Mr. Harold Davies, Engineer and Manager.

After supper the party were joined by Alderman G. Clark, J.P., and Councillor Swale, Chairman and Vice-Chairman of the Gas Committee, when a musical programme given by members of the Department brought an enjoyable evening to a close with the singing of "Auld Lang Syne."

During the interval Mr. Davies gave the toast of the Gas Department and thanked all present for their loyal co-operation in the past. He said he felt sure that he could confidently look to them for the same in the future. Alderman Clark responded, and said that he had been associated with the Gas Undertaking in Chesterfield for a period of twenty-one years. He congratulated the Engineer and staff on the very efficient manner in which the services of the various departments were carried out.

Shanklin Gas Company.

An Extraordinary General Meeting of the Shanklin Gas Company was held at the Offices of the Company on Wednesday, Dec. 16, 1931.

Mr. R. R. I. Russell, Chairman, presided. Mr. E. D. Davey, F.C.A., the Company's Accountant, was also present. The Directors held proxies to the value of £31,007.

The notice convening the meeting was read by the Secretary, Mr. Frank C. Taylor.

The Chairman having given details governing the exchange of stock and having answered a number of questions, proposed the following resolution:

> "That the draft now submitted of the Special Order for which application has been made to the Board of Trade under the Gas Undertakings Acts, 1920 and 1929, to authorize (among other matters) the change of name of the Company the transfer to and vesting in the Company of the undertaking of the Ventnor Gas and Water Company and for the purposes of the undertaking of the Company the raising of additional and loan capital of the amounts stated in the Order be approved subject to such alterations as may be made therein by the Board of Trade and approved by the Directors of this Company."

This was seconded by Alderman G. A. Blackall, J.P., who said he considered the Company would be in very capable hands of Directors and Secretary. The resolution was then carried unanimously.

Mr. Middleton, Chairman of the Ventnor Gas and Water Company, gave some interesting figures as to the progress of the Ventnor Undertaking, and stated that one result of the amalgamation would be an immediate reduction of 1s. 3d. per 1000 c.ft. in the price of gas at Ventnor, which would mean a lot in this time of economy.

A letter was read from Mr. A. W. Oke, who being unable to attend the meeting had written, "I am quite sure the amalgamation is quite the right thing for the Shanklin shareholders. With the handsome reduction in the price of gas, I feel sure there will be a large increase in the sale in Ventnor."

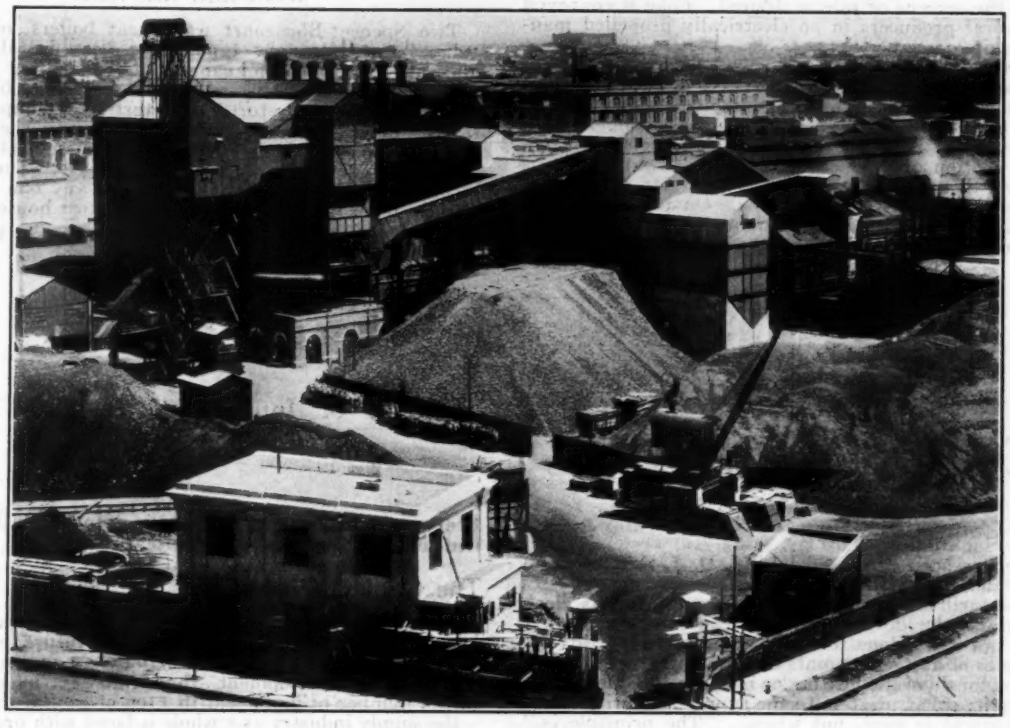
REVIEWS

MATHIESONS' HANDBOOK FOR INVESTORS.

No one in any way acquainted with financial affairs is likely to question the justice of our statement when we refer to Messrs. Fredc. C. Mathieson & Sons, of 16, Copthall Avenue, London, E.C. 2, as being "the friends of investors." Publications are issued by them which are really essential to those desiring to keep themselves fully posted as to developments in the world of stocks and shares. We have before us at the moment a particularly useful batch, in which place of honour must be given to "Mathieson's Handbook for Investors for 1932;" being a concise record of Stock Exchange prices and dividends for the past ten years of selected securities. This is the thirty-third year of issue, and the price of 5s. net is an extremely moderate one when the heavy work entailed in compilation and the very large number of the selected securities are taken into account. There are, by the way, about a dozen representative gas companies included. Then there is a pamphlet upon the subject of "Grossing-up Equity Dividends for Total Income," the price of which is 6d., and with the two is a neat little pocket folder telling us more about income-tax, and setting forth the Stock Exchange settling days during 1932.

BUENOS AIRES*

Glover-West Verticals in the Argentine Republic



GENERAL VIEW OF THE CARBONIZING, HANDLING, AND STORAGE PLANT.

The origin of the Primitiva Gas Company of Buenos Aires, Ltd., dates back to the year 1855, when the "Gas Lighting Company of Buenos Aires" was formed, with a gas-works on the site now occupied by the Plazo Brittanica at Retiro. The name of this Company was changed to "The Primitiva Gas Company of Buenos Aires, Ltd.," in September, 1887. Between the years 1855 and 1897 no fewer than six gas companies were formed in Buenos Aires, and although the life of some of these was of short duration, there still existed at the beginning of the present century three important companies supplying gas within the limits of the Argentine capital: the Primitive Company, the River Plate Gas Company, and the Buenos Aires New Gas Company. The three companies were amalgamated early in 1910 to form the present Primitiva Gas Company of Buenos Aires. The Company's area of supply covers 77 square miles. It distributed during 1930 over 2200 million c.ft. through 1253 miles of mains. Some idea of the progress made by the Company during the past few years may be drawn from the fact that the number of consumers and the total gas production last year represented increases of 108 p.ct. and 59 p.ct. respectively over the corresponding figures for the year 1924. The number of gas-consuming appliances sold by the Company during the past year exceeded 14,000, the vast majority of these being of British manufacture.

Corrales Works.

During recent years all gas-making has been concentrated at the Corrales Works, which is situated some three miles from the port of Buenos Aires.

Construction on the present site began in 1889. The works covers some 12 acres, but to this an area of 8½ acres has recently been annexed. The present daily production is about 12¾ million c.ft., and the ultimate planned capacity is 30 millions.

Besides horizontal retort houses representing a daily capacity of 3 million c.ft., and two carburetted water-gas plants, each capable of a daily output of 1,700,000 c.ft., there are two retort houses equipped with Glover-West vertical retorts. The No. 1 house was installed in 1926, and comprises eight settings of 33 in. new model retorts with a daily capacity of 3½ million c.ft. The continued increase of gas consumption necessitated an extension of the carbonizing plant, and in 1930 the second installation of Glover-West vertical retorts was built in No. 2 retort house, followed immediately by a further extension in 1931. These two installations make up the complete No. 2 retort house in eight settings of 50 in. new model retorts, with a total daily capacity of 5,600,000 c.ft.

Oil Gas Production.

Incorporated in the 1930 scheme was an interesting development in the form of a number of cast-iron retorts of special design, heated by waste gases from the settings for the production of oil gas. There are two oil gas retorts per setting of eight coal-gas retorts. The arrangement has proved very satisfactory in operation and a paying proposition at the prices of coal and oil ruling in Buenos Aires.

Ultimately there will be 400,000 tons of British coal used annually in this works. This material is transported from the docks by a fleet of Foden steam wagons, which are discharged into a concrete coal hopper below ground level. It is elevated in a 3-ton automatic skip discharging into a hopper on the top of the elevator structure. From this point it is fed either into one or other of the two belt conveyors supplying the vertical retort houses, or into a long chute leading down to a coal pile, whence it is distributed by means of a Beaumont drag scraper over a storage pile in the shape of a fan. This open-air coal store has a capacity of 13,000 tons, and the scraper is capable of handling 100 tons of coal per hour at 100 ft. radius.

The same apparatus re-claims the coal as required from the storage pile, and re-elevates it to the distributing hopper. From the belt conveyors, which are seen in the illustration across the gables of the retort houses, coal is delivered to one or other of the West lip-bucket conveyors, two of which encircle each retort bench.

Coke Handling Plant.

Coke discharged from the retorts is received in the bottom strand of one of the lip-bucket conveyors in each house and discharged either direct into the producer feed hopper or into a chute feeding the inclined belt conveyor seen in the illustration. The points of discharge of coke and reception of coal from and to the lip-bucket conveyors are so arranged that each conveyor can handle both

* From "West's Gas."

materials simultaneously and without interference with either operation.

In case of necessity coke can be carried on the top strand of the lip-bucket conveyor in No. 2 retort house and discharged into special breeches chutes leading to the belt conveyors, by means of which it is carried to the bottom strand of the conveyor in the No. 1 retort house, and thence to the screens or pile as desired. Coke is conveyed to the several producers in an electrically propelled man-carrying skip.

Coke from No. 1 house is conveyed direct by the lip-bucket conveyors, and that from No. 2 house by way of the inclined belt conveyor, to the screening and storing plant. This consists of a battery of steel hoppers of a total capacity of 420 tons, divided into ten compartments for the reception of the four sizes into which the coke is graded and distributed by means of two sets of the new West balanced reciprocating screens. On the other sides of the hoppers is a range of bagging platforms, for delivery to road vehicles, with several vibrating mesh screens and weighing machines. The surplus is distributed in the yard by hand-operated wagons.

Gas storage is provided by 13 holders at the works and in the district with a total capacity of 7½ million c.ft., which is increased to ten millions by the new waterless holder just completed.

Waste-Heat Recovery.

Two Spencer-Bonecourt waste-heat boilers, of the fire-tube, induced-draught type, have been installed, automatically controlled and capable of evaporating 11,000 lbs. of water per hour from and at 100° C. These boilers provide steam for the retorts, oil retort feed pumps, and extractor drive. The surplus is conveyed to the works in combination with steam from the two waste-heat boilers in the adjoining No. 1 vertical retort house. The arrangement of the steam piping is such that any one boiler can supply steam to any part of the two retort houses.

H. D. D.

ON THE - - - - ELECTRICAL SIDE

Items of Interest to the Gas Industry

A Time-Controlled Tariff.

Surprise has been expressed by Mr. D. J. Bolton, in an article in the "Electrical Review," wherein he discusses a domestic tariff in conjunction with a synchronous clock (to encourage the development of economic loads), that more has not been done in the way of special tariffs for certain times of day. He points out that, whether the current is used for domestic heating or lighting, the same cables must carry it; what matters to the supply authority is not how the current is used, but when. "The principle is," he says, "simple and fair, and contains no difficulties for the non-technical public. A certain rate up to a certain time of day, and another rate after this, is perfectly easy to understand and to comply with. The difficulty, of course, lies in the metering, since time clocks have in the past been somewhat expensive both in first cost and in the labour entailed in winding, &c. It is on this point that a suggestion has to be made. There are now on the market in this country several makes of synchronous electric clocks which supply Greenwich time from the A.C. mains. Before very long the whole country will be linked to one identical frequency whose constancy can presumably be relied upon. The actual mechanism can in some cases be bought wholesale at a price of something under £1, which is itself no more than the cost of the meter required under a two-rate tariff. Conditions therefore seem ripe for the development (for domestic A.C. systems) of a cheap induction meter combined with a synchronous clock in such a way as to register at two or even three different rates at different times of day. If the change were effected mechanically by altering the gear train, the extra mechanism might be expensive, but if done electrically the arrangement could be quite a simple one. The tariff might then take the form of a standard rate (say) 4d. per KW.-H., with the proviso that units taken from 8 p.m. to midnight were metered and charged at half rate, and those from midnight to 4 p.m. at one-third rate or less."

The Right Kind of Protest.

The proposal of the Irish Electricity Supply Board to make an increase of 25 p.ct. in their charges for current has been referred to several times in the pages of the "JOURNAL." The proposal is unpopular in Limerick, where a meeting to protest against it has been held by the citizens. At this meeting it was stated that 170 private consumers of electricity in Limerick had already instructed the gas undertaking to install gas in their houses.

A Troublesome Practice.

An unpleasant feature of their prepayment meter business (which has also at times been the cause of troublesome steps by gas undertakings) is developing among the electricity concerns. It is reported that a Russian woman, who was a consumer of the Hendon Electric Supply Company, had been fined for fraudulently consuming electricity. Out of 67 coins found in the shilling in the slot meter, 57 were old Russian kopecks, two were Belgian francs, and only eight were English shillings. The practice was stated, during the hearing, to be getting prevalent, not only in Hendon, but elsewhere.

The Capital Outlook.

A technical correspondent of the "Financial Times" has lately been urging that, "if the future progress in electricity supply is not followed by an improvement in the intensive development—that is to say, in an increase in the number of units sold to £100 of capital expenditure—the supply industry as a whole is faced with progressively decreasing revenue from working per unit of capital expenditure." If, as is anticipated will be the case, by the end of 1932 the work upon the National Power Scheme by the Electricity Commission and Central Board is complete, and according to official figures approximately 80 p.ct. of the area of Great Britain, including 99 p.ct. of its population, has been brought into reach of electricity supply, capital expenditure on generating and transmission equipment must inevitably increase, for the grid is no more than a framework which must be filled in. A table shows that, per £100 of capital expenditure, the revenue from working has during the last ten years substantially decreased, though at the same time there has been some increase in the number of units sold. Capital expenditure is going to be a difficulty with the industry for a long time to come.

Flats Replace Chelsea Slum Dwellings.

Discussing four blocks of new flats that have been erected in place of slum houses in the area between the King's Road, Chelsea, and the Embankment, the "Electrician," after saying that there is not a single electric light among them, goes on to give some enlightening details: "Gas is used for lighting and cooking, and we were informed that as the Gas Company piped the premises free and installed the fittings on a system which provided for payment by means of a slight increase in the price of gas, whereas in the case of electricity a heavy charge for connecting up and wiring would have had to be paid, and there was also difficulty in regard to lamp replacements, as well as a considerable difference in the cost of current as compared with gas, electricity excluded itself, although those concerned would have preferred it. It was also stated that this was far from being an isolated experience." In the following issue an extract was quoted from a letter of the Chelsea Electric Supply Company, which dealt further with the difficulty of lamp replacements: "Even if the cost of the electric wiring were provided for and the current supplied at a low fixed charge per week per tenement, according to the size of the tenement, the charge might still be rather beyond the means of tenants who are only to pay such a very small rent. There would also remain the difficulty of the cost of renewal of electric lamps, which we should not be prepared to undertake. On the system of the use of the supply at a fixed charge per week during unlimited hours, the main check on a wasteful use of the current is the fact that the user would be unnecessarily wearing out his lamps, and consequently having to pay more for their renewal."

Morecambe and Heysham Empire Christmas Pudding

Cooked by Gas and Served to 4500 People

GAS AIDS RECORD PUDDING BOIL.

Ten thousand people on Boxing Day morning witnessed the spectacle of cutting the first slices of the 1000-lb. Empire Christmas Pudding on the promenade at Morecambe, the progressive Lancashire seaside resort.

The ingredients for this, all of which were of Empire origin, were thoroughly mixed, and the pudding was placed in the special boiler on the Wednesday afternoon. The boiler, 6 ft. high and 6 ft. in diameter, weighed over a ton, and the water was boiled solely by gas. This was done by four high-pressure combustors, loaned by the Metropolitan Fuel Company, of London, and the equipment certainly carried out the work efficiently. The water was in the first instance brought to the boil under two hours, and was maintained at boiling-point by two combustors. Thus a level temperature was assured, such as would have been impossible with coal or coke, as was originally planned.

The recipe supplied by the Empire Marketing Board was that of the King's Chef, Mr. Cedard, and it was a first-class pudding mixture. The pudding was cooked in a special cradle of sailcloth and netting (exactly on the lines of a fisherman's net), but it was felt that a definite metal or pot receptacle would be better in order that all the juices could be retained. This will undoubtedly be done on the next occasion, for it is realized locally that this must now become an annual event.

As a result of the organizers' first venture, they are fully satisfied that there is really no limit to the size of the pudding which can be cooked in this way by gas—and visions of a ton or a ton-and-a-half pudding are being held lightly.

From 10.30 on Boxing Day morning for three hours portions were being served out as fast as a large staff could deal with them; 3600 portions were actually served on the promenade, and in addition nearly 900 were reserved for dispatch by post to all parts of the country. To serve 4500 portions from a single pudding is no mean achievement.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

THE REDUCING POWER OF BLAST FURNACE COKE TOWARDS CARBON DIOXIDE AND A NEW APPARATUS FOR ITS DETERMINATION.

M. Rieffell in "Chemie et Industrie," 1931, 26, 280-288 (August) and 531-540 (September), reviews previous methods proposed for the determination of the reactivity of coke, discusses the significance of reactivity, and describes a new method and the results of his determinations.

The reduction of iron ore in the blast furnace is, according to the author, best expressed by the reaction

$$Fe_2O_3 + 6\,CO = Fe + 3\,CO + 3\,CO_2$$

which takes into account the oxidizing effect of the carbon dioxide on the iron produced, which effect must be prevented by the presence of a sufficient excess of carbon monoxide. Hence the coke should have sufficient reactivity to enable this excess of carbon monoxide to be realized. The method described facilitates the choice of a suitable coke. It enables not only the reactivity to be determined, but also the different phases of the reduction as the carbon dioxide acts progressively on the coke. The coke is tested in the form of grains of size 2-1 mm. The tube in which the charge, which occupies a volume of 25 c.c., is heated, has a bore of 10 mm. The test is carried out in two stages. In the first stage, the sample is heated to a temperature of 950° C., and a curve showing the relation between the temperature and the pressure developed is obtained. In the second stage, the actual period of the test, the carbon dioxide is passed at 950° C. over the sample at the rate of 1 c.c. per second. At 5-minute intervals, 20 c.c. of the CO_2, after passage over the coke, is passed into a burette in which the resultant mixture of CO_2 and CO is measured and its carbon dioxide content is determined by absorption. This is subtracted from 20 c.c., and the resulting figure is taken as the volume of carbon dioxide converted into carbon monoxide. The reactivity is expressed as the percentage of carbon dioxide converted into carbon monoxide. A curve is drawn showing the reactivity against time.

The curves obtained for a variety of cokes are shown and, for comparison, the content of graphitic carbon, the mechanical resistance (drum test), and the coking temperature are appended.

It is concluded that the reactivity is influenced mainly by the relative amounts of graphitic and amorphous carbon present in the coke and by the mechanical resistance. With increase in the mechanical resistance and in the graphitic carbon content, the reactivity decreases.

A blast furnace coke should have a reactivity not less than 40 p.ct. and a mechanical resistance (drum test) not less than 75. Cokes may be classified as follows:

(1) *Reactivity below 40 p.ct.*—Coke generally very hard, often graphitized. Unsuitable for blast furnaces but suitable as foundry coke.
(2) *Reactivity between 40 and 75 p.ct.*—Blast furnace coke.
(3) *Reactivity above 75 p.ct.*—Gas coke. Generally too low in strength for blast furnace purposes.

This classification enables the blast furnace operator to assess sufficiently accurately the value of a new consignment of coke when due account has been taken of the ash and sulphur content.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Modern Public Lighting by Gas

[Extract from a paper read by Mr. C. I. Winstone, of the Gas Light and Coke Company, before the London and Southern District Junior Gas Association on Dec. 11]

The territory over which I have to work covers 540 square miles spread over six counties, from Sunningdale on the Southampton Road in Berkshire, to Great Wakering, two miles from the North Sea in Essex, a territory which has nearly one hundred different local authorities, and which is supplied with electricity by fifty separate electricity supply undertakings, and on Jan. 1 next will be supplied by gas from one company. My work, therefore, varies from lighting a small village to lighting a London main road, and nothing but experience helps and guides one in the best way to overcome a difficulty.

The most important factor governing public lighting is cost. Public authorities have always to study the financial side of the question. It is in many cases "cost" before "candle power," and gas for public lighting must be sold at a rate lower than the rate charged to domestic consumers to be able to enter into competition. To charge the same price as that charged to domestic consumers is wrong, and the companies that are doing this are not adopting the right policy with regard to their public lighting. The amount of discount of course must depend on circumstances.

Maintenance.

Maintenance, to me, means perfect maintenance, the dozen or so lamps in a small village being maintained as efficiently as in a central London borough of 4000 lamps or more.

I have seen gas installations in big provincial towns where lamps have not been cleaned for three weeks or a month, many of them without reflectors, mantles and burners sooted up through dirty gauzes, and Holophane refractors so yellow that the distribution of light would have been better without them. An old-fashioned installation maintained well is far better for the Industry than a modern installation maintained badly.

The most important part of the burner is the gauze. Keep the gauze clean and 90 p.ct. of bad lights will disappear. The system of maintenance should be so arranged that by rota 10 p.ct. of the lamps should have their burners taken out and cleaned every week. This means that every burner is cleaned once in ten weeks. This work should be done by the lighter in the course of his daily work, and it will reduce bad lights to a minimum. He should book up the positions of the lamps where he has done this work, and an examination should be made of one man's work a week to see that the work is being carried out properly.

In an area covering 45,000 lamps where this method is employed, it is practically impossible to find a bad light. In my opinion a burner without a gauze or disc is a necessity for public lighting. Where this type of burner is used low maintenance costs and good lights are assured.

The reflector and the glass of lamps in towns should be cleaned not less than once a week, and in country districts not less than once in two weeks. A lamp in clean country air will be as clean at the end of two weeks as a lamp in a town at the end of one week.

Only mantles of the finest quality should be used for public lighting. Good mantles used under the conditions I have just mentioned will give a practically straight line illumination throughout their life, because a mantle breaks and has to be renewed long before the candle power commences to fall. In a district where these points are studied the mantle average is only 2·5 per nozzle per annum and there is never a broken mantle on the district after the men have finished their nightly survey.

Every lamp should be included in a nightly survey at lighting time, but there is no necessity where a good type of clock controller is in use for a survey at extinguishing time.

Clock Controllers.

Clock controllers should be used as much as possible. They remove the idea of gas lighting being old-fashioned. The cost of the by-pass necessitated by the use of a clock controller is more than paid for by the good condition in which it will keep the lamp. It will double the life of a tin lamp and preserve the life of a copper one. The glass of the lamp will keep cleaner owing to the glass being always warm. It will keep the mantle dry and lengthen its life. It will prevent the glass of a globe or square lamp from breaking in frosty weather, and it need not burn more than one-fifth c.ft. per hour during non-lighting hours.

The advantage of a by-pass in a lamp is not appreciated generally, because its value in many ways is worth far more than its cost. All clock controllers should go for three weeks with one winding. By this means, whether the clock is wound once a week or once a fortnight, there is always enough tension left on the spring to ensure the clock keeping good time, or in case of a longer period between the usual winding times through any unforeseen delay in the work.

I will now deal with a few points regarding new installations. The planning of a new installation to conform to a specification demands careful thought and attention to the characteristics of the particular thoroughfare to be lighted. One can by calculation get very near to the candle power, spacing and height required, to give the necessary illumination. A small section can then be erected and tests made to verify the calculations and from the information obtained slight alterations can be made to meet the requirements exactly. For instance, in thoroughfares where the buildings are of a certain type, reflection will materially alter the calculations.

There are high-pressure and low-pressure installations of various types in London at the present time which are of great use to gas engineers, as they offer a very practical means for checking calculations to obtain any desired results in any ordinary type of street. For instance, the centrally hung low-pressure installation in Bayswater Road, which is the finest of its kind, gives a straight line, Class "E" lighting, with 10-lt. globe lamps with an average spacing of 115 ft. and a height of 20 ft. above the road.

The remarkable feature about this installation is that with the system of maintenance already described the illumination at the test point is 0·1 ft.-candle, and the variation up or down is so slight as to be almost negligible.

This thoroughfare is also provided with a very satisfactory type of gas illuminated guard post which is being adopted by other municipalities.

No electrical installation anywhere can give such constant illumination. Engineers who have seen the illumination on the roadway from this installation are surprised when it is proved to them that it is Class "E"—viz., 0·1 ft.-candle at the test point. Nearly all the engineers estimating from visual observation thought the lighting was in a much higher class. It proves that it is necessary for all local authorities which are contemplating improving their lighting according to the B.E.S.A. Specification, to inspect an existing installation which is known to conform accurately to a certain classification so as to obtain a true impression of the amount of light a certain rating will give.

The King's Road, Chelsea, installation of 10-lt. globe lamps 22 ft. high and 4 ft. over the roadway on steel poles approximately 140 ft. apart, gives an illumination of 0·08 ft.-candles at the test point, and this is a constant illumination.

The low-pressure 6-lt. line burner globe lamps in High Street, St. Giles, Holborn, give an illumination in Class

"E." The centrally-hung high-pressure system in Tottenham Court Road gives an illumination in Class "C," and there are many more which are checked every week to see that the illumination is maintained.

Centrally-hung Installations.

There is no doubt that to obtain the maximum efficiency in illumination, the lamps should be suspended over the roadway. Lamps fixed anywhere between 4 ft. from the kerb line and the centre of the roadway will give better illumination than if fixed over the kerb line. The danger to pedestrians is when they are crossing the road, and therefore the road should receive first consideration in regard to illumination.

Steel columns are cheaper to buy, easier to fix, safer in use than cast iron ones, and will not fall to pieces when collided with by a vehicle, and when fitted with ornamental cast iron bases look good when seen by day. Where, however, it is impossible on account of the expense to fix new steel columns, a great improvement can be made in any road by fixing a 1 ft. 6 in. or 2 ft. extension piece on the top of the ordinary 10 ft. 6 in. column and then fixing a swan-neck and a globe lamp with the 6-lt. staggered line burner with a reflector not less than 21 in. in diameter.

It must be remembered that vehicles nowadays are much higher than they were in the days when the present short columns were fixed. It is therefore necessary to have all lamps not less than 14 ft. 6 in. from the ground in main roads so as to be above the height of a passing vehicle.

The size of the reflector is an important matter. No light is wanted above the lamp, and to give you an idea how this question has been studied it is found necessary for 6-lt. cluster globe lamps to have reflectors 21 in. in diameter, 10-lt. globe lamps to have reflectors 30 in. in diameter, and for centrally hung high-pressure lamps, reflectors 3 ft. in diameter. All available light is directed downwards in these cases. A large diameter reflector also reduces the number of globes used, and there are several other advantages which can be obtained by their use owing to this type of reflector giving better protection from wind and rain.

When planning new installations one important thing to remember is that it should be so designed that lighting and maintenance can be carried out easily and cheaply. It is wise to spend a little more money on the installation and include certain devices which enable defects to be remedied quickly; otherwise a far greater amount of money will be spent in labour during the years the installation is in use through not giving this important matter attention in the first instance.

The units in the King's Road, Chelsea, are on an average 140 ft. apart. The light source is a 10-lt. globe lamp fitted with a flat reflector 30 in. in diameter with a 3-tier stainless steel reflector at positions where it is not necessary to have any backward light; for instance, where lamps are not at the corners of streets. The steel poles are fluted, 28 ft. high above ground, and are fitted with a cast-iron base. The lamps are hung 4 ft. over the roadway, and the light source is 22 ft. from the ground. The lighting and extinguishing of the lamps is done by Horstmann control switches.

Where there is a large number of units of this type it is cheaper to use a tower ladder than fit every lamp with a raising and lowering gear. This method of lighting obviates all condensation troubles which affect the by-pass. The full pressure of gas is right up to the lamp.

Experiments are being made with a view to the more efficient distribution of light by using half frosted globes and clear globes. Pear shaped globes are used because they keep clean longer and give a better distribution of light. It is bad practice to use round or squat shaped globes, because they collect the dirt and therefore require more frequent cleaning.

A special by-pass stirrup was made to enable the lamp attendant to turn on the gas while on the tower ladder when cleaning and maintaining, to avoid having to turn on from the base.

Reflectors.

The use of directive reflectors is an advantage in public lighting, providing they do not cause glare. The majority of them increase the illumination from 150 to 200 p.ct. at an angle of from 10° to 20° below the horizontal, if adjusted correctly. There are many different types, details of which are published with their respective polar curves in all the makers' catalogues. The most important thing to remember about these reflecting devices is that they must be examined and adjusted after lighting time, and great care must be used when cleaning them not to move them from the angle in which they are set. It is therefore very necessary to have a sturdy fitting, and in suspension lamps a "no turn" cup and ball must be used.

Refractors of the Holophane type are also good, but they must be kept clean. The best method of cleaning in this case is by the use of a nail brush so that the dirt is removed from the grooves.

Many kinds of material are used for reflectors, such as silvered glass, stainless steel and chromium on copper. Stainless steel seems to be the most economical in use because the surface is hard and retains its polish for a long time, and an important advantage about it is that as the material is very stiff, it does not get bent from the correct angle so easily as chromium on copper, and, unlike glass, will not break. Another simple and cheap method of increasing the illumination in the roadway is to glaze the back of the lamp with opal glass.

One more point with regard to installations is important. Every gas company should fix and maintain in each council's district in its area a small installation of the latest and most efficient types of public lighting units. They should be fixed in a position in the town where the public can see them, and they should, of course, be maintained in the best condition.

The B.E.S.A. Specification.

The B.E.S.A. specification for street lighting was compiled to enable a classification to be made of the amount of ft.-candle illumination falling on points in the street which are equidistant between light sources. It is set out to improve and grade the illumination by placing certain values into various classes lettered from "A" to "H." The value of the illumination in a thoroughfare according to the specification is decided upon by testing in this way.

The electricians in many cases use devices which direct the light almost in a beam on to this test point for the purpose of obtaining a high reading at the expense of the rest of the area illuminated, and by this means create a fictitious value to enable them to say the street is in a high classification.

The chairman of the committee which brought out this specification has stated that this method of distribution was never intended to be used, and the lumeter proves that it is wrong. The average illumination is far more important than the amount of light falling on the consecutive test points along the road between lamps. In fact, I believe this is the only country which adopts the test points method of measurement for grading road illumination.

Another clause which is unsatisfactory is the amount of depreciation allowed under service conditions while at the same time permitting the lighting to be graded in a classification which it does not reach. If you contract to supply and maintain an installation in Class "D" which means one-fifth of a ft.-candle at the test point, and the specification allows 50 p.ct. drop under service conditions, the installation can fall into Class "E" and yet it is classified as Class "D." I know of no other specification which allows so much depreciation under service conditions.

In the preface of the specification it is mentioned that "a British Standard Specification for street lighting must deliberately set a standard of highway lighting which is higher than that commonly existing at the present time." It seems, however, that the "higher standard" is rather a nebulous quantity. For instance, take clause 18:

> "In service the authority responsible for the maintenance of the installation shall not allow the mean test point illuminations in any class of street installation given in Table I. and Clause 15 to fall below 0·5 times the minimum rated mean test point illumination specified in Table I. and Clause 15 for that class. *Unless otherwise specially prescribed, the illuminations at any of the test points under service conditions shall not be less than 0·5 times the service mean test point illuminations obtained on test. The service illumination at any individual test point shall not in any circumstances fall below 0·25 times the rated mean test point illumination given in Table I. and Clause* 15.

This clause concludes with a note that:

> "The difference between the values of the rated and the service mean test point illuminations is necessary in order to allow for the unavoidable variations in the spacing and to provide for *decrease of the candle power of the light sources, variation due to replacements or incorrect adjustment of the light source* in the fittings, *soiling of glass and reflecting surfaces of the fittings, changes in voltage* or gas pressure and other factors which may cause the service illumination to fall below the rated illumination."

These allowances have an important bearing on the so-called low maintenance costs which are always brought forward in arguments for electric lighting, and the following analysis shows how this is so.

(*a*) *Decrease of candle-power.*—This has recently been proved through a series of tests of some low power electric lamps which are commonly used for ordinary street lighting. A 31 p.ct. fall in candle-power in 950 hours has been

the average of three lamps which have been under constant observation.

(*b*) *Considerable variation of illumination may result from incorrect adjustment of the electric lamps, refracting devices or reflectors.*—That this is so has been noticed in a well-known London main road, and results of investigation show that at the two test points for both sides of the road there is variation of the order of 3 to 1. The average figures measured are 0·15 ft.-candle at the south test point, and 0·05 ft.-candle at the north side test point. In good practice the value should be equal. Again, an average illumination test was made in the same road and excessive patchiness was recorded. This defect is obvious when one walks along the road. Certain parts of the road nearer the lamp than are the test points have lower degrees of illumination.

(*c*) *Variation of illumination due to the soiling of glassware and reflectors.*—This is a direct attempt to allow the electric lighting authorities to quote the minimum of maintenance. Instead of a regular weekly or fortnightly cleaning of the lamps, advantage is taken of this allowance and insufficient cleaning is the result. One has only to walk through some of the electrically lighted boroughs to prove this, and this is how "economies affected by modern electric street lighting" are made.

It is known by lighting engineers that there is no difficulty in maintaining an almost straight line illumination from a gas lamp providing it is maintained efficiently.

A clause which allows so great a depreciation under service conditions gives a big advantage to the electricians in quoting for lighting contracts. A gas lighting installation can be fixed which will give the rated illumination on the first night and continue to do so every night with a very small depreciation in the illumination, but owing to the rapid depreciation of the electric lamps no electrical installation can do this.

Average Illumination.

What is far more important than the illumination at certain points in the street is the average illumination over the surface of the roadway, and for the purpose of obtaining information with regard to what relation the average illumination bears to the test point illumination, several installations have been examined with the lumeter. The method adopted for this examination was to divide the area of the roadway between two lamps into 10 ft. squares, and to take readings at each intersection of the squares and obtain the average of all the readings.

By this means it was possible to see what relation the average illumination bore to the specification test point. The following details of tests taken in certain thoroughfares are interesting:

Name of Thoroughfare.	B.E.S.A. Test Point Illumination and Class.		Average Illumination and Class.	
	Ft.-Candle.	Class.	Ft.-Candle.	Class.
Regent Street	0·37	D	0·95	B
Cannon Street	0·37	D	0·80	C
Bayswater Road	0·095	E	0·5	C
High Street, Holborn . . .	0·12	E	0·4	D
Oxford and Cambridge Terrace	0·032	G	0·11	E
Victoria Street	0·2	D	0·54	C

Points in Favour of Gas for Public Lighting.

Some of the points in favour of gas for street lighting are worth bringing to your notice. They are unassailable and should be brought to the notice of municipal authorities. The electricians claim that they can do everything that gas can do, and do it better. The Gas Industry does not claim that it can do everything that electricity can do, but it does claim that it can light the streets better, for the following reasons.

A gas lamp will give a candle-power which will remain constant no matter how long it burns, whereas an electric lamp loses its candle-power gradually during its life until at the end of 1000 hours, if it lasts as long, the candle-power may fall as much as 40 p.ct.

The difference between the two illuminants in this respect is that the candle-power of an electric lamp falls before the filament breaks, whereas with a gas burner the mantle breaks before the candle-power falls. The renewal of the mantle, therefore, keeps the candle-power constant. The effect of voltage variations on electric lighting has far more serious results in candle-power than the effect of pressure variations in gas lighting, and the consumption of current, candle-power, and length of life of an electric lamp are a long way from the standard set out in the B.E.S.A. specification for electric Tungsten filament lamps.

The Board of Trade allows a variation of 4 p.ct. up or down in the rated circuit voltage. For the safety of the circuit and to prevent the shortening of the life of the lamps the voltage is more often far more than 4 p.ct. below the rated voltage. In fact, in many districts it is possible to see an improvement in the candle-power of the electric lamps with the finish of the peak lighting load. A 5 p.ct. drop in the voltage means a 17·5 drop in the candle-power of the lamps, whereas with a gas burner a 5 p.ct. drop in the pressure results in no reduction in the light from the burner. This has been proved by the Watson House research laboratory in a series of very careful tests carried out recently.

The following table shows the great difference in candle-power between electricity and gas owing to the voltage and pressure drops in the two illuminants.

Percentage of Voltage and Pressure Drop.	Percentage Less in Electric Candle-Power.	Percentage Less in Gas Candle-Power.
5	17·5	*Nil*
10	33·0	7·44
15	47·0	9·46

It will be noticed that there is apparently a decrease of 3·3 p.ct. in the candle-power from an electric lamp with every 1 p.ct. drop in voltage.

You can see, therefore, that the constant maintenance of candle-power is far easier to accomplish with gas than with electricity, and if a penalty clause were inserted in every public lighting contract the electrical industry could not possibly quote the low prices for public lighting which in some cases are quoted. In contracts where a penalty clause is in operation no allowance is made for any depreciation in the values quoted for the units. If the values decrease by only 1 p.ct., it is possible for the penalty to be enforced. How, then, is it possible to justify in any specification an allowance of 50 p.ct. for depreciation in illumination and even as much as 75 p.ct. in certain conditions as quoted by the B.E.S.A. Specification, if good lighting is to be maintained. All public lighting contracts should have a penalty clause inserted to guarantee the maintenance of the illumination quoted.

Wattage and Candle-Power.

Many of the municipal authorities express the value of their lighting in watts. Wattage is not an expression of candle-power and is of no help in comparing quotations regarding candle-power. It is accepted generally that the light from a gas lamp, owing to its colour, will penetrate farther in foggy weather than an electric lamp of equal candle-power.

From my own experience, in the London and Greater London areas, I find there are far more electric lamps out of lighting at night through broken filaments than there are gas lamps through broken mantles.

I live in what has been described as the best electrically lighted borough in London, but there are more electric lamps out every night in this borough than there are gas lamps out in the areas I have just mentioned. Even the lamp outside my house which is on a special lighting circuit was out of lighting five nights last year, and it has been out of lighting five nights this year through broken filaments. Taking the lighting hours on the average table for London as 3900, these lamps are lasting only 780 hours instead of a supposed 1000. How is it possible then for electric street lighting maintenance costs to be less than gas lighting maintenance costs if the candle-power is to be maintained?

(Since writing this paper the above lamp has been out of lighting two more nights.)

Another point to remember is that the inside of the glass of a gas lamp can be kept clean, and therefore there is no obstruction or absorption of the light rays, but with an electric lamp it is impossible to clean off the deposit which forms inside the globe which, together with the gradual diminution of light from the filament, causes a serious depreciation in the light long before the filament burns out. The electrical and municipal authorities cannot afford to change the lamps until they burn out.

Another factor in favour of gas for street lighting is its complete reliability. Owing to the complicated method of modern electrical transmission the supply of electricity cannot be guaranteed.

The Gas Industry gave its meed of praise to the electrical industry for the wonderful floodlighting the electricians carried out during the International Illumination Congress. What, therefore, must be the impression on fair-minded people when the following article was printed in one of the electrical journals with regard to the lighting in Whitehall under the heading of "The Whitehall Nightmare?"

> To some illuminating engineers better street lighting appears to mean merely greater intensity, otherwise it would be difficult to explain the nightmare that has been made of Whitehall by our gas friends. Apparently in a panic of apprehension at the inroads of electricity on their street

lighting preserves they have disfigured this thoroughfare with closely spaced aluminium coloured masts along each kerb and in the centre of the roadway, each carrying three large high-pressure lamps enclosed with clear glass. By day and night the effect is nasty and by night it is distressing, reminding us of a glaring railway goods yard. We hope that this atrocity is not to be a permanency, for although Whitehall after dark is hardly one of our most popular streets it is sufficiently used to give a large number of people a very bad idea of our taste in street lighting.

The Gas Industry will never descend to the level where falsification is used in commenting on the work and claims of a competitor.

Discussion.

The PRESIDENT inquired whether the street lamps were controlled by means of governors.

Mr. WINSTONE replied that they did not find it necessary in many cases; the pressure of their gas was such as not to necessitate the use of governors.

Mr. L. T. MINCHIN (Gas Light and Coke Company) remarked that electric installations gave much more light near the horizontal, which greatly reduced the ability to see. The point of the size of reflectors was interesting. The benefits obtained were solely due to increased candle-power; but they were working in the right direction by increasing the apparent size of the light source. By having a large source they did not get so big a shadow. In King's Road, Chelsea, reflectors were only placed on the house sides of the lamps, and he would like to know the reason for this. In the course of some further remarks, Mr. Minchin said that he fully agreed that when an authority paid for a certain class of illumination they should not get lighting in a lesser class.

Mr. F. C. SMITH (Gas Light and Coke Company) congratulated Mr. Winstone on what he termed his aggressive salesmanship, carried out in the right spirit, in an effort to maintain the position of gas for public lighting. The Institution of Gas Engineers were very much alive to the necessity for sustaining their position in regard to street lighting. If the Gas Industry was really going to hold its own, the key was the street lighting problem, and it behoved them all to be up and doing, to consider the planning of new installations, and also to decide what best could be done to maintain existing installations at the highest pitch of efficiency. In regard to the comments of electrical people about the Whitehall illumination during the recent International Illumination Congress, his Company had put up what they considered a reasonable piece of work, though they realized it was by no means perfect. They set out to show the members of the Congress just what a class "A" street should be like. There was no other street in London conforming to this specification, and the general reception of Whitehall was good, though many criticized. At a recent meeting reference had been made to the installation, and he was glad to say that it came in for its share of praise by many people in the opposite camp. It was nice to feel that among the better informed they did come in for quite good criticism.

AN EXCELLENT PRODUCT.

It was gratifying that the Gas Industry was noticed for the first time in the latest B.E.S.A. specification regarding the iso-candle diagram. There were many matters connected with illuminating engineering that the Gas Industry needed to look to. The electrical industry had put in a great deal of intensive work in recent years and had any number of men extremely well equipped to deal with this lighting problem. The Gas Industry should remember that they had an excellent product to offer, and they must have the necessary knowledge to utilize this product to the best advantage. In regard to the matter of fog penetration by gas lights, went on Mr. Smith, actual measurements were extremely difficult to obtain. Watson House was at the present time co-operating with the Meteorological Office in connection with this matter. They hoped in the course of two or three years to be able to make an authoritative statement on the question of fog penetration. They had erected lamps with which to make practical tests on the lines suggested by Watson House before the Institution of Gas Engineers, and he hoped the results would be such as would be welcomed by the Gas Industry.

Capt. W. J. LIBERTY (late Superintendent of Public Lighting to the City of London) said he was delighted that the Association was at last having a paper on public lighting. This was the first time (Mr. J. G. Clark's contribution last year excepted) since the inception of the Association thirty years ago that a paper on the subject had been contributed—as though public lighting had no relation to the Gas Industry. Their thanks were due to the author of the paper for the mass of first-hand information which could not fail to be of use to those in charge of public lighting.

THE RIGHT IMPRESSION.

Getting the right impression which deals with certain thoroughfares conforming to a Specification demand, continued Capt. Liberty, is alone worth having, for it enables those who have perused the B.E.S.A. Standard Specification and scanned the Classification of Installations, studied the table from "A" to "H," and the "foot-candles," and still remain in doubt, to visit the various installations named and see for themselves the effect of the foot-candle illumination as set out in the standard Specification. They will then be in a position to choose for or advise their committees and help them to a decision as to the "class" they would wish in certain streets of their city or town.

Take the examples given—the centrally-suspended low-pressure lighting of Bayswater Road and also High Street, Holborn, both class "E." The centrally-hung high-pressure system in Tottenham Court Road is class "C," while the Cannon Street centrally-suspended high-pressure lighting put up in 1909 is in class "D," as is Regent Street and Victoria Street, both of which are high-pressure lamps on "staggered" posts. All these are "test-point" illuminations; but what Mr. Winstone wishes to draw attention to is that had they been "average illumination" tests they would without exception be in one class, and in some cases two "classes," higher than that letter denoted, though they would have been more efficiently illuminated. This being so, in his opinion, the "average illumination" test is more useful and more fair than "test-point" illumination, and he would be inclined to go further than Mr. Winstone and ignore the "test point" in favour of "average illumination" test. For it is better to have the surface of the road evenly illuminated throughout its entire length than by sundry light rays or beams projected. This may be useful for trying out certain tests, but it is dangerous from a motorist's point of view.

Mr. C. C. Paterson (President of the International Illumination Congress), continued Capt. Liberty, called attention at the Edinburgh Conference in his paper on the Standard Specification to the "exaggerated attention" given by lighting authorities to the test-point illumination to the exclusion of other factors which make for good lighting—"with the object thereby of jockeying an installation into the next 'class' of the specification." This, he believed, is what Mr. Winstone is trying to stress. Mr. Winstone calls attention to the tolerance between rated and service conditions. He agreed with him when he said that a tolerance of 50 p.ct. under service conditions and 75 p.ct. under certain conditions is far too great a drop, for with such a fall in illumination allowed it puts the thoroughfare in quite a different class than it was in under "rated" conditions. If a municipality is paying for "B" or "C" illumination it has a right to that illumination.

CENTRALLY-SUSPENDED LIGHTING.

He was glad to have Mr. Winstone's testimony as to centrally-suspended lighting, especially in tree-lined roads. "This justifies the new system of lighting recently installed on the Victoria Embankment with its trams and four lines of fast moving motor traffic, also the centrally-hung lighting on the Hastings Road at Lewisham and Catford. He says it is also suitable for roads that have no illumination from lighted buildings. This I found when lighting the main roads of the City of London wholly with this type of installation for both gas and electricity nearly twenty years ago, and it has never been altered. Centrally-suspended lighting by high-pressure or high-power low-pressure multiple burner lamps is a practicable method of lighting our chief traffic roads.

"Many of you who may want to increase the lighting of your areas, but cannot do so because of financial stringency in these days, can do much by raising the mounting heights by extension pieces with suitable burners in the existing lanterns. It will surprise you to note the great improvement in the illumination of the road surfaces by so doing. Mr. Winstone mentioned the cleaning of lanterns, &c., not less than once a week in towns and once in two weeks in the country. I always had my glassware cleaned twice a week in the City of London.

"I have been agitating for the appointment of competent Public Lighting Superintendents ever since I conceived the idea of starting an Association of Public Lighting Engineers, so that an officer could give his whole time to this important task. A questionnaire I sent to Local Authorities as to the officer actually responsible for this duty brought me many queer replies. I shall continue to press this matter, for there was never a greater need for improved lighting than the present, when we learn from statistics that during the third quarter of 1931 no less than 329 pedestrians were killed and 15,424 were injured, of which 85 were killed in London alone. When such officers are appointed we shall have such excellent lighting as Mr. Winstone has given examples of to-night."

Mr. P. RICHBELL (Croydon) referred to the maintenance of lamps, remarking that a number of them had been fortunate enough when the International Illumination Congress was in progress to have the opportunity of driving round most of the streets which were under Mr. Winstone's supervision, and he could assure them that Mr. Winstone's remarks were well borne out.

Mr. MCCASKGILL (Tonbridge) inquired about the use of reflectors. His own Town Council examined the use of a reflector on an electric lamp, and passed it by as an unnecessary expenditure.

EDUCATING THE PUBLIC.

Mr. R. J. PEPPER (Gas Light and Coke Company) remarked that three times recently in his experience he had been discussing domestic gas lighting, and people had quoted various streets in London as electrically lighted. Most people were under the impression that the majority of the better lighted streets were electric. The public should be educated to realize when streets were gas lighted. Another point in favour of gas lighting was the absence of glare. On some of the by-pass roads it was customary to use high-power electric lamps, with the result that motorists came out of the darkness into intense light and then out again into darkness, which was extremely

trying. On the point of keeping the costs down the economy of gas lighting should be stressed.

The Author's Reply.

Mr. Winstone, replying to points raised in the course of the discussion, in regard to the question of reflectors, said that where one used a simple reflector only each lamp was shining on two test points. If the reflector was on the other side as well it would spoil the effect, as one would get a shadow along the road. With only one reflector one obtained a very even distribution of light. They tried this in the Bayswater Road, but the engineer did not like it; it threw the light along the centre of the road and took it away from the footpaths. Referring to Mr. Smith's remarks on the planning of new installations, Mr. Winstone said that it all depended on how the installation was planned whether it was going to be run cheaply or cost a lot of money.

They must accept the iso-candle diagram with caution, he continued; it was prepared in a laboratory under the best conditions. Also the voltage of the electric lamps was right up to scratch. The only place, however, to test an installation was on the street under working conditions. The diagram was useful to a certain extent, but it was difficult to understand.

There were no figures on the question of fog penetration. He could only repeat what the policeman said! In regard to the Tonbridge installation, mentioned by Mr. McCaskgill, he did not know what type of reflector was used. There were many types on electric lamps in London that it would be better to take away. In many cases they threw a very strong light on the road where it was not wanted. He fully agreed with the matter of educating the public. He had notices put upon the lamps in Whitehall, bearing the words, "City of Westminster—High-Power Gas Lights," while on various other installations there were similar notices.

Vote of Thanks.

Mr. H. C. Sims proposed and Mr. P. Richbell seconded a vote of thanks to the authors of both papers [Mr. Deas' paper was published last week], which was carried unanimously, the authors briefly replying.

Dry Gas Meter Design

By J. H. Bingham, M.I.Mech.E., M.I.Chem.E., &c., of Messrs. George Glover & Co., Ltd., Ranelagh Works, Chelsea

[Extract of a Paper at a Meeting of the Yorkshire Junior Gas Association in Bradford, Dec. 12—*concluded from p. 785*]

Fundamental Principles Underlying the Construction and Regulation of the Meter.

As a general rule, gas meters (excepting those of the wet type) depend for their ability to measure on the inflation and deflation of chambers, the movable members of which are formed by leather diaphragms. The displacement of these diaphragms between one and the other limit of movement forms the basis upon which is calculated the measurement of gas passing through the meter.

A common construction of measuring chamber consists of a shallow cylinder formed by a band of metal secured to a vertical median partition of the meter. Actually this dividing wall or partition supports two such cylinders of like dimensions, one on each side of it. Fixed to the open ends of these shallow cylinders, by means of a cord, wire, or metal band tied circumferentially round them, are two discs of leather forming the diaphragms. As these diaphragms have to move into and out of the shallow cylinders to which they are attached, it follows that the diameters of the leather discs must be larger than the diameters of the cylinders, otherwise no movement, apart from that capable of being produced by stretching, would be possible.

The diaphragm leathers, before being fixed, are usually supported each between two metal discs fixed concentrically with the diaphragms, but having diameters less than that of the shallow cylinders in and out of which the diaphragms move.

Consider fig. 1. If gas is first admitted to cylinder "A" the diaphragm will move outwards until it reaches the position shown. It is now no longer admitted to cylinder "A," but passes instead to chamber "B." The diaphragm will move inwards to the position shown dotted, assuming of course that the gas in "A" is free to exhaust. We now have the two extreme positions of the diaphragm, and the cubic content of the space bounded by the diaphragm at these two positions represents the amount of gas displaced and is spoken of as the capacity of the diaphragms.

In one cycle of operations both diaphragms move inwards and outwards. The output per cycle or revolution is therefore the sum of the two diaphragm displacements, which displacements are as nearly as possible equal to each other. Their approach to equality depends, of course, on uniformity of construction. In the actual cycle one diaphragm is moving in advance of the other by one-quarter of a revolution—that is to say, when one diaphragm has completed one-half of its outward travel away from the dividing wall of the meter, the other diaphragm commences to move outwards from the partition. Similarly, when the first diaphragm has travelled half way towards the dividing wall from its other extreme position, the second diaphragm begins its inward movement. The reason for this is that, were the two diaphragms to change direction at the same moment, it would be impossible to translate their horizontal axial movement into a harmonious rotary motion required for the mechanism in the upper structure of the engine. This may be likened to an engine crank shaft which, if constructed with two diametrically opposed throws, would result in what is termed "dead centre."

The flow of gas through each half of the meter is governed by a valve similar in type to that of a simple steam engine. For the purposes of explanation, the gas meter can in fact be likened to a two-cylinder steam engine. Each cylinder is controlled by a D-shaped valve reciprocating on a triple port grating. The end ports admit gas alternately to each side of the diaphragm or piston, as we may call it. The central port is the exhaust port and is

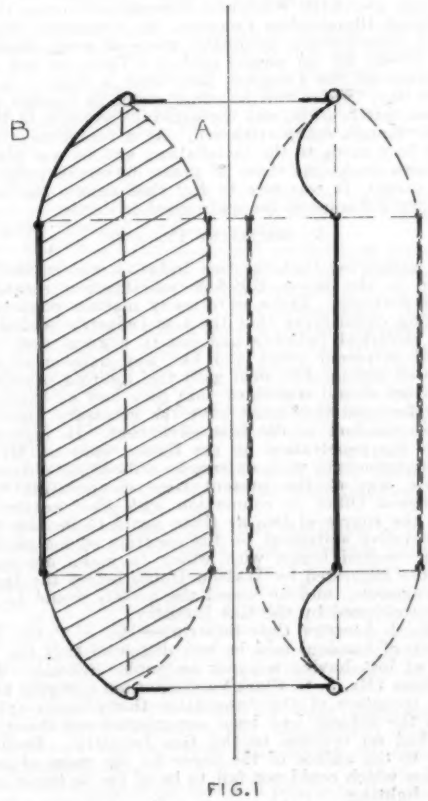


FIG. 1

coupled in turn by the D-valve to each of the end ports, allowing the gas to pass from one side of the diaphragm at the same time that a further supply is being admitted to the other side. The exhaust or central ports have ducts or channels beneath them communicating with a common outlet pipe.

The valve cycle must now be arranged to conform to the cycle of operations of the diaphragms previously described. It was shown that when one diaphragm had moved half way along its outward stroke the other diaphragm would

commence to move in a similar direction. This means that when gas has been admitted to one side of one diaphragm for half its period, gas commences to exert pressure on the other diaphragm in the same sense or direction. If we divide the cycle of each diaphragm into four parts—viz.:

First half admission outwards
Second half admission outwards
First half admission inwards
Second half admission inwards

the relation of the cycle of the second diaphragm to that of the first is as follows:

Diaphragm 1.	*Diaphragm* 2.
1st half admission outwards	
2nd ,, ,, ,,	1st half admission outwards
1st ,, ,, inwards	2nd ,, ,, ,,
2nd ,, ,, ,,	1st ,, ,, inwards
	2nd ,, ,, ,,

Fig. 2 shows in section a common type of D-valve with triple port grating, the right-hand port admitting gas to the inner side of the diaphragm and the left-hand one to the opposite side. The centre port opens to a chamber connected with the outlet pipe. The valve is shown in a balanced position over the grating. Immediately it is moved to the left, the right-hand port opens at A. The travel is then continued until this port is fully open, as in

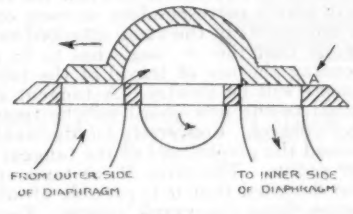


FIG. 2

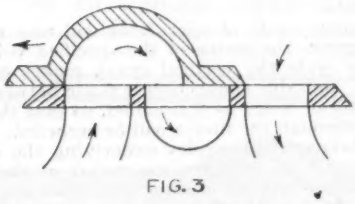


FIG. 3

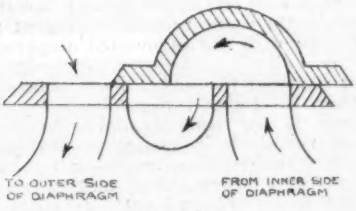


FIG. 4

fig. 3. The direction of movement of the valve is then reversed until it returns again to the position shown in fig. 2. Further movement in this direction opens the right-hand port at the point B, the dome in the valve coupling this port with the central or exhaust port. Simultaneously with the opening of the right-hand port at B the other port begins to open at C, and the pressure of the gas is transferred to the outer side of the diaphragm. As the diaphragm is propelled in its new direction the gas is driven from the inner side of the diaphragm under the dome of the valve and through the exhaust. On arriving at the position shown in fig. 4, the direction of travel is again reversed.

The movement of this valve will now be shown correlatively to that of the diaphragm which it governs.

Diaphragm 1.	*Valve* 1.
1st half admission outwards	1st half left movement
2nd ,, ,, ,,	1st ,, right ,,
1st ,, ,, inwards	2nd ,, ,, ,,
2nd ,, ,, ,,	2nd ,, left ,,

The reciprocating movement of the valve, if translated into a circular motion, would be as shown in fig. 5.

The translation can be achieved by the use of a crank and connecting rod represented diagrammatically as in fig. 6.

It will be observed that the radius of the crank circle is substantially equal to the width of the inlet ports.

As the second valve must be one-quarter of a cycle behind the first one, its position relative to that of the first valve must be such that its four stages of movement are in the following sequence:

2nd half left
1st ,, ,,
1st ,, right
2nd ,, ,,

It will therefore be seen that the second valve must be placed at right-angles to the first one. A reference to fig. 7 will explain this. Looking at the diagram with Valve 1 in the horizontal position, the four arrows round the crank circle show that the crank moves.

Half left, half right, half right, half left.

If the diagram is now turned so that Valve 2 is in the horizontal position, it is seen that the crank in relation to this valve moves:

Half left, half left, half right, half right.

It has therefore been demonstrated that, if the valves controlling the two diaphragms are placed with their axes

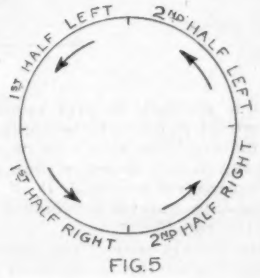


FIG. 5

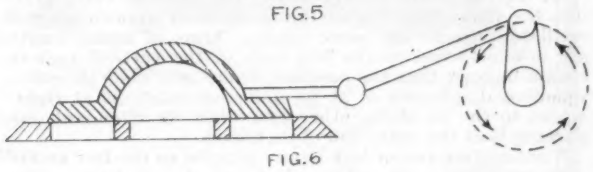


FIG. 6

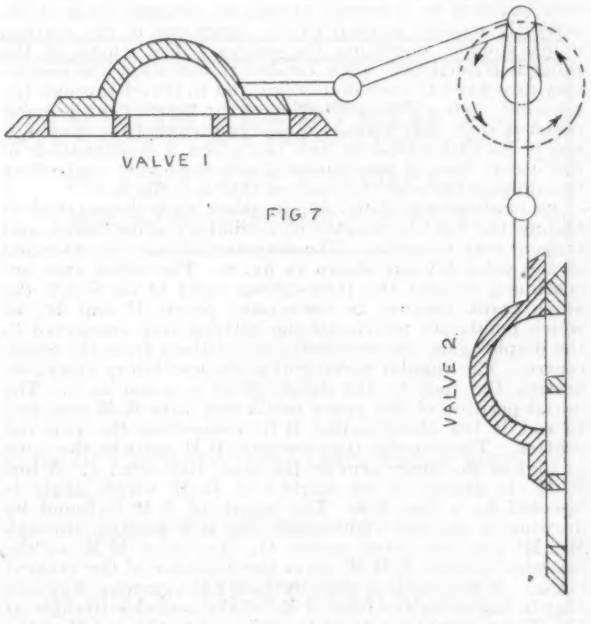


FIG 7

at right-angles to each other and a crank with a throw equal to twice the width of one of the inlet ports of the valve gratings is centred at the point of intersection of the two valve axes, a valve lay-out with a suitable actuation for propelling the two diaphragms in the desired manner will result.

If the valve and crank of fig. 7 be projected through 90° on to a horizontal plane, we have the disposition as actually seen when looking at the valve plate of the meter. This is shown in fig. 8.

A driving connection between the diaphragms and crank is now required. The axial movement, or horizontal travel of the diaphragms, has to be translated to give a rotary movement to the vertical crank.

To the outer metal disc of each pair supporting the leather diaphragms is attached, in a vertical plane, a member in the form of a bracket, and to the open ends of each

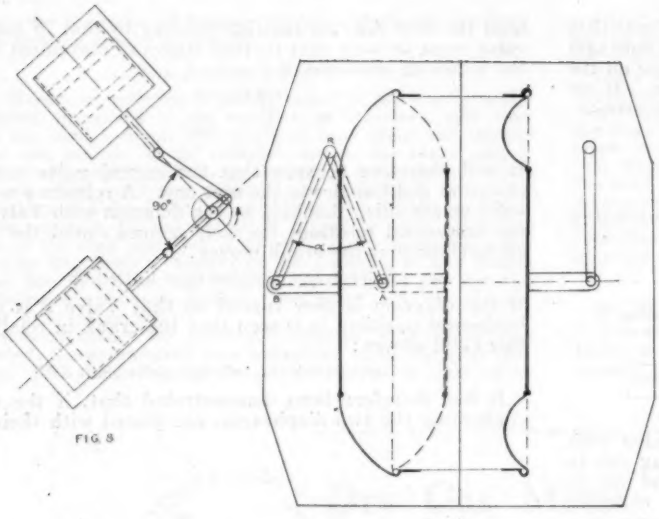


FIG. 8

FIG. 9

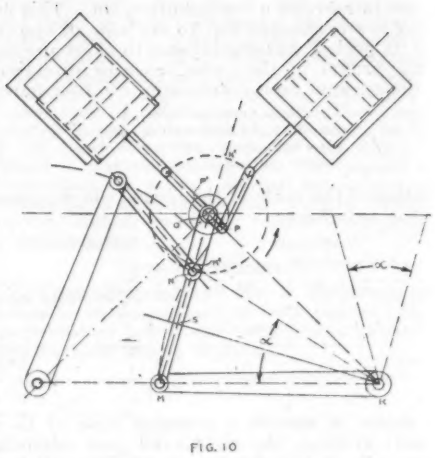


FIG. 10

of these brackets is pivoted an arm secured at its other extremity to a vertical rod free to oscillate in a bearing at the base of the meter. The two rods with their connections to the diaphragms are shown in plan in fig. 9.

For a definite horizontal travel A B of the diaphragms there is a corresponding angular movement of the arm A R about the axis of the rod R.

As the two vertical rods project through the valve plate into the upper chamber of the meter their upper ends will oscillate through the same angle. Arms of equal length are now attached to the free ends of the vertical rods in such a manner that the position of one arm when its corresponding diaphragm is at its inner extremity is at right-angles to the lie of the other arm when its attendant diaphragm is at the outer end of its travel.

A connecting rod or link is now pivoted to the free end of each oscillatory arm. The other end of each link is likewise pivoted to a second crank, or tangent as it is incorrectly named, secured to the upper end of the vertical crank spindle, operating the valves. The length of the tangent is such that when rotated it will allow the oscillatory arm fixed to each diaphragm rod to travel through the required angle. The inclination of the tangent to the valve crank is such that when a diaphragm begins to move outwards its corresponding link lies along a continuation of the centre line of the tangent, and the valve controlling this diaphragm is at the position shown in fig. 2.

An explanation of fig. 10, together with the method of finding the relative lengths of oscillatory arms, links, and tangent may be useful. The diagram is really an extension of the valve lay-out shown in fig. 8. The valve axes are continued beyond the intersecting point O on which the valve crank rotates, to convenient points R and R^1, at which points are positioned the vertical rods connected to the diaphragms, the rods being equidistant from the crank centre. The angular movement of the oscillatory arms connecting the rods to the diaphragms is given as α. The initial position of the upper oscillatory arm R M attached to rod R lies along a line R R^1 connecting the two rod centres. The angular travel of arm R M must be the same as that of the lower arm on the same rod—viz., α. A line R M^1 is drawn at an angle α to R M which angle is bisected by a line R S. The length of R M is found by drawing a line at right-angles to R S passing through M S M^1 and the crank centre O. The base M M^1 of the isosceles triangle R M M^1 gives the diameter of the tangent circle. If this circle is described with O as centre it is seen that it intersects the base M M^1 of the isosceles triangle at N. The required length of link pivoted to the end M of the rod R M and the outer end of the tangent is M N. As the diaphragm attached to rod R moves outwards the pivot M travels along an arc of which M M^1 is the chord. By the time it reaches the point M^1 the tangent has travelled through 180° and has arrived at the position O N^1. The valve crank O P has also passed through a semi-circle to O P^1, while the valve in the same half of the meter has completed that half cycle which admits gas to the inner side of the diaphragm. If equal pairs of arms and links be coupled at a common point M on the tangent, synchronization of the two diaphragms and their valves will result.

Owing to the impracticability of producing two diaphragms, uniform in all dimensions and with total displacements coinciding with the specified output per revolution of the meter, some provision must be made for correction adjustments. It is obvious that once the diaphragms are assembled and enclosed the only factor in the capacity capable of variation is the horizontal travel or stroke. Any alteration in this will increase or decrease the total displacement and will give a corresponding increase or decrease in the angular movement of the arms attached to the vertical rod. Assuming that the α angle has to be reduced, the chord subtending the arc of travel of the pivotal ends of the upper arms will be shorter. A tangent circle with a diameter equal to the new chord will be required to give correct valve control. Conversely, if the angle of oscillation is increased the pivotal end of the tangent must rotate on a greater radius. The pivot M, or tangent pin as it is termed, is so designed that it is capable of adjustment towards or away from the crank centre. This allows the diaphragm travels to be set to give the pre-determined displacements.

One complete cycle of operations will now result in the passage through the meter of the specified volume of gas. During this cycle the vertical crank makes one complete revolution. Suitable connection is made between the crank and a counter or index as it is called, so that the amount of gas passed through the meter will be recorded.

The fundamental principles underlying the construction and working of an ordinary gas meter of the lights type have been described. The same principles are equally applicable to Standard and high-capacity meters, although modifications in the arm, link, and tangent motions are necessary to cope with the augmented diaphragm displacements.

Restricted space in the meter itself makes necessary a departure from the lights type or basic lay-out. Unfortunately there is not time available to describe these modifications, neither is it possible to discourse on questions of testing, registration, or absorption losses. These aspects of gas meter design and regulation furnish in themselves sufficient material for a lengthy treatise. It is hoped, however, that what has already been said will prove sufficiently interesting to foster in the minds of the listeners a desire for further enlightenment on the subject of gas meters. The essence of to-day's paper should form a suitable basis for the study of the one-time neglected, but now all-important adjunct to the gas service, and for the encouragement of such work the writer is ready at all times to give advice and guidance in the solution of any problems with which those in pursuit of their studies or investigations may be confronted.

Discussion.

The PRESIDENT (Mr. J. W. Holroyd) said it was probably true that a good many men who handled meters in the course of ordinary work did not treat them quite with the respect due to a really delicate and valuable piece of mechanism. While they were all aware of the importance of measuring gas, probably comparatively few members of the Industry gave as much thought as they should do to the design and detailed functions of that measuring process.

Mr. B. THORPE (Huddersfield), remarking on the manner in which the two valves in the meter worked, one with a slight lead on the movement of the other, in order to maintain a perfect rotary motion, said he presumed that if this was not done the result would probably be jumpy lights. Mr. Thorpe said he had several questions which he would like to ask Mr. Bingham although not strictly arising out of the nature of the day's address. He would value that gentleman's opinion on the comparative desirability of the radial type of valve as against the reciprocal type. Personally, he believed that with the radial type one got a considerably reduced friction. He would also

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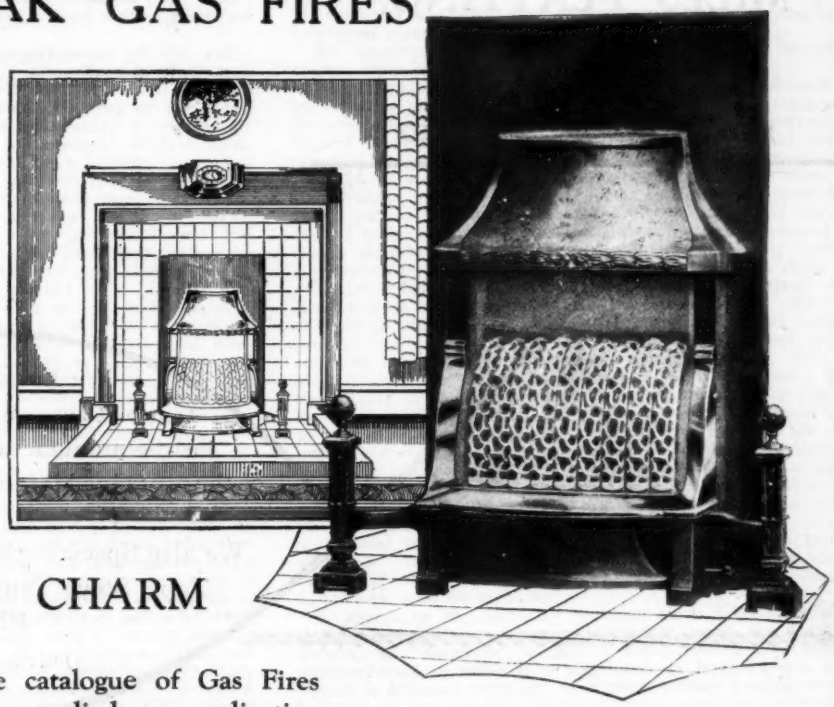

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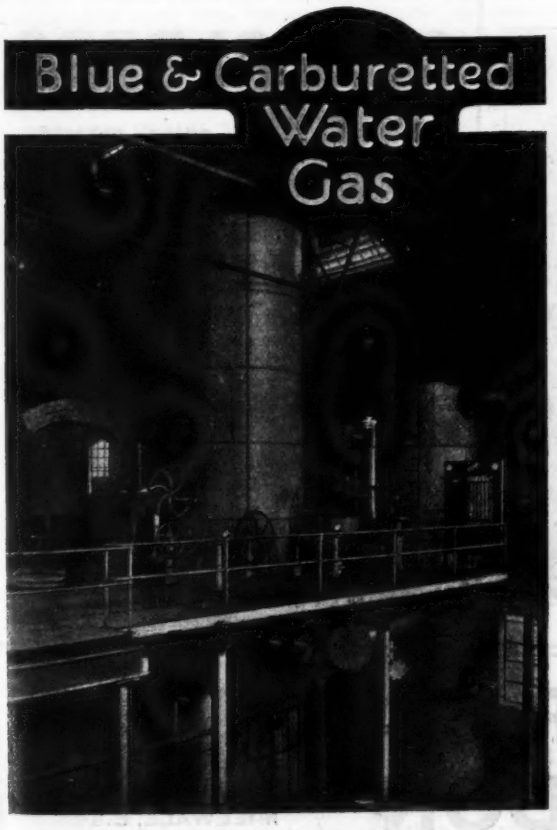

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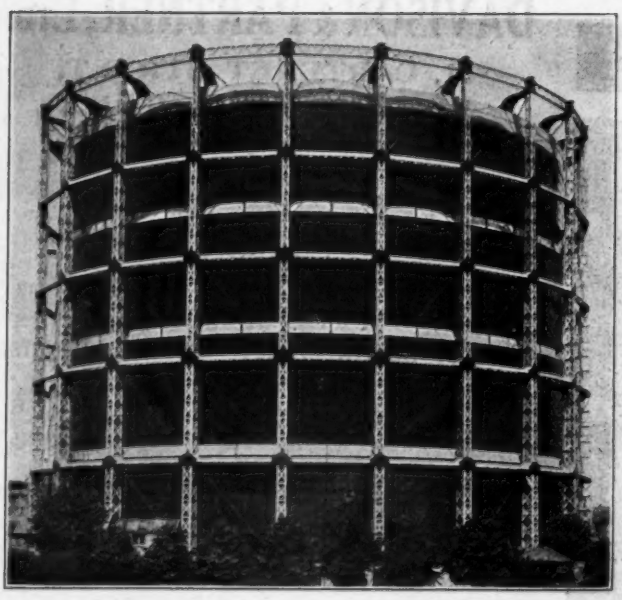

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like Mr. Bingham's opinion on the horizontal crank movement in a meter as compared with the vertical movement. Also, could he give an opinion on the comparative value of almond oil or castor oil as the better preservative for leather diaphragms, and what gauge and quality of tinplate was used in (say) a three-light meter. Mr. Thorpe suggested, in regard to the painting of meters, that meter makers would be well advised to use a base coating of a good lead paint before applying the surface enamel paint. He was afraid a good many meters had only the one top coat, with a good deal of corrosion as a result.

Mr. BINGHAM, replying, said the movement of one valve slightly ahead of the other certainly was of such effect that if it did not function there would be jumpy lights, but this was not actually the primary reason of one valve being set 90° ahead of the other. The chief object was to ensure a continuous uniform movement to the crank. As a matter of fact, even on the system as it was there would be a liability to jumpy lights when there was excessive wear and tear in these individual members, because the valve setting was then upset. In answer to the question as to radial *versus* reciprocal valves, Mr. Bingham said he would remind the meeting that radial valves were by no means a new thing. They were in use as long as sixty years ago, and he had never been able to understand why their use had not lasted at that time. If ever any member of the Association got hold of an old meter bearing the name of Crombie they would see a radial valve of sixty years ago. Radial valves had since been revived, and were being used now in exactly the same way as sixty years ago. The method was the same, though into the revival of the type there had undoubtedly been put the results of research in design and reinforcement of moving parts to help attain higher capacities. The question of the advantage of radial type over reciprocal type was a matter on which at present he (Mr. Bingham) had an open mind. He was, as a matter of fact, engaged in a scientific survey and comparison of the two, and he would not care to commit himself to a definite opinion at present. He also had a radial valve meter, but he used radial valves in an entirely different way. He hoped one day to be in a position to give the results of his observations and experiments in a definite form. On the question as to comparative value of almond oil or castor oil, he had had no personal experience of the application of castor oil for the treatment of meter leathers. Messrs. Glover used almond oil, mixed with a certain amount of graphite for filling up the pores of the leathers. This was the oil specified by Dr. Lamb, a foremost authority on the subject, through the South Metropolitan Gas Company. In regard to the gauge of plates, he had not figures by him of the gauges for the fairly wide range of meters made. It was not altogether in the thickness of the foundation of the baseplate itself that one looked for resistance to corrosion, so much as in the casing. Mr. Bingham said he quite agreed with Mr. Thorpe as to the desirability of a lead base paint for meter cases. Messrs. Glover coated their meters with white lead before putting colour on to them. Enamel paints were being extensively used nowadays, and a good many firms had adopted cellulose treatment. Whether that would be found as lasting as the ordinary paint Mr. Bingham was not in a position to say. There were so many different grades, and he rather thought it was still a matter subject to a good deal of research. Some were inclined to chip and have no depth in them. In the matter of corrosion generally, there was perhaps not quite the amount of attack nowadays that there used to be, owing to the fact that the meters were often in a better position than formerly. In regard to the horizontal crank movement as compared with the vertical, he thought this was purely a matter of design. The principle was the same so long as regard was paid to the wearing qualities.

OVERLOADING OF METERS.

Mr. J. W. HORWILL (Bradford) said Mr. Bingham's remarks on the danger of overloading meters prompted the question as to whether that gentleman knew of the existence of anything in the way of mechanical maximum demand indicator for attachment to meters or to the service pipe. In these days of two-part tariffs of various characters, and the competition of electricity services based on maximum demand charges, one wondered whether the Gas Industry might consider something in the way of charging on maximum demand, controlled by an attachment at or near the meter. If the revenue of an undertaking was based on the maximum system there should surely be some instrument which would be continually putting up the pointer to meet such maximum demand, and only be amended at the will of the meter inspector. Mr. Horwill said he thought in these days of keen competition there was a growing need for standardization of meters as well as various other appliances. Mr. Bingham had mentioned some twelve different sizes of meters, whereas he (Mr. Horwill) thought that by some co-operation between manufacturers and the Gas Industry it should really be possible to reduce that number to perhaps four or six, and thereby effect a substanial saving in manufacturing costs and selling prices. One wondered whether it was at the makers' end or in the Gas Industry that the stumbling block existed which was holding back more standardization of meters, and whether something could not be done to bring it about. Mr. Thorpe's remarks, said Mr. Horwill, had put into his mind a thought as to the amount of deposit found in meters. He had often wondered why meters working in similar places, under identical conditions and with the same gas, suffered such different effects in the matter of moisture deposit in them. One found some being brought out quite dry, yet others in exactly similar situation had a lot of moisture in them. It seemed to him that this tendency towards condensation in meters was more prevalent to-day than formerly.

Mr. BINGHAM said he had never before had the question as to a maximum demand indicator put to him, though he had certainly given attention, from the makers' standpoint, to the matter as a safety valve, so that a meter could not be worked beyond a specified maximum load. This idea of a maximum demand indicator for sales purposes was certainly interesting, and it might be that the two ideas could be worked together. He assumed what Mr. Horwill suggested was a maximum and minimum recorder on the meter?

Mr. HORWILL: Maximum will serve; minimum would not matter from our point of view.

Mr. BINGHAM said he thought there would be a need for a time measurer to enter into this matter. It was an interesting point, to which he would certainly give further consideration. In regard to standardization of meters, he really could not say whether there might be an impediment, as suggested by Mr. Horwill, to a reduction in the number of types and sizes. He had perhaps given some indication as to this impediment when, in his paper, he remarked that there were still users who continued to pin their faith to the lights meter for general purposes, despite the fact that such meters were only intended for measuring gas consumed for lighting, and that there were others who insisted on the retention of the lights named, qualified by some such phrase as "double capacity," &c. He rather thought the matter depended on the desires of the Gas Industry, and he was afraid that at the moment he could not see any signs of any move towards meter standardization. The only thing possible seemed to be to educate the Gas Industry to see the futility of so large a range of types, and the big variation even in specifications for each of these types. The makers had to ring the changes on variations in designs to satisfy the differing requirements of various gas engineers, all of whom had their own ideas as to what they wanted. Mr. Bingham said he believed that if it were possible the meter makers themselves would reduce the number of types. But where was the impetus to come from? The meter maker might reduce his range of styles and say to the Gas Industry, "I have three types to offer, and you must have them or do without;" but they all knew quite well that no meter manufacturing firm could afford to take up such an attitude.

In regard to Mr. Horwill's question as to differing effects in deposit in meters working under pretty much the same conditions, Mr. Bingham thought it was probably a question of temperature. A great deal depended on temperature, and it varied in different premises, even though other conditions might be more or less similar. Further, there might be syphoning in the pipes in one place and not in the other. If conditions were absolutely identical one could see no reason why there should by any material difference in degree of deposit, but it was hardly likely that conditions in two different houses or neighbouring premises were absolutely identical in every respect. Personally, Mr. Bingham did not think condensation had anything like so deleterious an effect on meters as the deposition of naphthalene, and it was changes in temperature that chiefly brought the latter about.

STANDARD UNIONS AND THREADS.

Mr. D. T. LIVESEY (Doncaster) asked whether the lack of standardization of unions and connections was similarly to be put down to laxity or diversity of ideas in the Gas Industry. What, if any, was the objection of makers to the adoption of a standard size union and thread in connections?

Mr. BINGHAM: The engineer has his pipes and caps already fixed. They may have been supplied twenty or thirty years ago, when the idea of any kind of standardization was little thought about; and rather than have them melted he must get something to fit them. Gas meters have been produced now for sixty or eighty years, and in those early days there was no standardization of anything. Many of the old service fittings are still in use, and threads are required to correspond with them.

Mr. Bingham said he thought it was perhaps in this matter of couplings that standardization of meters might make a beginning. The makers would be glad enough to have to produce nothing other than standard fittings, and he believed that in a few years there would be a more general standard in that direction as old fittings and pipe ends were gradually discarded.

Mr. F. CLEGG (Huddersfield) raised a question as to who was the most likely to be the loser—the seller or the buyer of gas—in case of a puncture in a meter case and an escape of gas unregistered.

Mr. BINGHAM said it was largely a question of just where the puncture happened to be. An internal leak might mean that a small quantity of gas was passing through the meter and into the outlet pipe without influencing the registering apparatus, and in such case the loss would be against the selling undertaking.

In the course of some more or less informal cross-talk between Mr. Clegg and Mr. Livesey on the one hand, and Mr. Bingham on the other, the view was expressed that there were circumstances in which the loss might be against the consumer rather than the seller. Mr. Bingham agreed that that might be so where, for instance, there was a leak in the meter case allowing a certain amount of gas to escape into the atmosphere without being registered, but not so much as to prevent the registering apparatus being worked by the rest of the gas in practically the normal degree. The registration of gas might in such a case be more or less the same as if the whole of the gas had been consumed, and thus the buyer would lose a little; but in

the main, Mr. Bingham's opinion was that leakage was likely to be against the seller, and it was up to undertakings to see that their men handled meters as a delicate mechanism should be handled, and reasonable care taken to avoid such leakages, whether internal or outward.

Mr. J. W. Wood, M.Sc. (Leeds), proposing a vote of thanks to the lecturer, said that many contrary opinions had been expressed at various times and places as to the extent to which meters of different types might be overloaded. Mr. Bingham had made clear to the meeting that day the relationship between the lights meter and the high-capacity types. One could, Mr. Wood believed, ring the changes a good deal on the capacity of the diaphragm, the speed at which the mechanism moved, and the pressure drop through a meter, and decision as to whether or how far a meter would stand a proportion of overloading depended largely on the particular point which the manufacturer himself selected. A point to which Mr. Bingham had not referred that day, and to which he (Mr. Wood) had rather expected to hear some reference, concerned the intricacy and strict accuracy of working parts of a meter. Mr. Bingham had stressed the fact that a meter was a delicate piece of mechanism and as accurate as a mechanism could be made, but there was a feeling sometimes expressed in the Industry that in the final assembly of meters there was still a great deal too much left to the skill and judgment of the individual workman, with the variations in such skill and judgment as were inevitable in the human element.

Mr. R. N. Webb (Leeds) seconded the vote of thanks.

Mr. Bingham, replying, said that although great advance had been made in the production of gas meters, he was quite ready to agree there was still much more to be done. To his mind, the gas meter industry, with all its advance, was still only in its infancy. He himself was engaged very much on research work at the present time.

Gas Bills for 1932

(*Continued from p. 786.*)

Brownhills Urban District Council.

One of the parts of a Bill to be promoted by the Council provides for the transfer to them of the undertaking of the Ogley Hay and Brownhills Gas Company, Ltd., on such terms as may be agreed upon or as may be settled by arbitration. The purchase is to be completed on or before April 1, 1933. There are clauses authorizing the Council to supply gas within the limits which are scheduled.

[*Parliamentary Agents: Messrs. Lees & Co.*]

Kettering Gas Company.

One of the objects of this Bill is to empower the Company to lay pipes in private streets. It also prohibits the Kettering Urban District Council from imposing conditions or restrictions on the form of light, heat, power, or energy to be supplied or used in the Council's houses or buildings, or from giving any preference or priority, or causing any prejudice or disadvantage in connection with such supply. The preamble to the Bill states that the Council has prohibited or restricted the supply of gas to approximately 1000 of its houses.

[*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

Mid-Southern District Utility Company.

One of the objects of this Bill is to change the name of the Company to Mid-Southern Utility Company. Power is given to increase the capital by Special Order to be made by the Electricity Commissioners and confirmed by the Minister of Transport, after consultation with the Minister of Health and the Board of Trade. The powers conferred by Section 40 of the Gas-Works Clauses Act, 1871, are extended to the recovery of rent or money due to the Company for the hire or fixing of gas fittings. Other clauses relate to electricity.

[*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, & Blyth.*]

Oakham Gas and Electricity Company, Ltd.

Under this Bill the Company seek power to increase their share capital by £20,000, to an amount not exceeding £47,000. Any shares not sold by auction or tender may be offered at the reserve price to existing shareholders, employees, or consumers, in such proportions as the Directors think fit. Any shares still unsold may then be disposed of for the best price obtainable. With the approval of the Board of Trade, however, the Company may offer shares to consumers or employees at the average market value of the six months preceding the offer, or may offer such shares for subscription by the public. The Company may borrow up to a limit of 75 p.ct. of the share capital actually issued. Dividends on preference shares shall not exceed 5 p.ct. on shares issued before 1923, or 7 p.ct. on shares issued after 1923. Dividends paid on ordinary capital shall be in the ratio of 10 p.ct. on the original capital, 7 p.ct. on the existing ordinary shares other than original capital, and 8 p.ct. on new ordinary shares. These rates shall be subject to variation in accordance with a sliding-scale.

Power is sought to create a gas special purposes fund, to meet expenses incurred in connection with accidents, strikes, unavoidable circumstances, or in the replacement or removal of plant or work. This fund shall not exceed one-tenth of the gas capital. Authority is also asked to create a gas renewal fund, not exceeding one-twentieth of the gas capital, to meet expenses in connection with the maintenance and renewal of plant and works. The Company is to be relieved from the obligation to provide any new or increased supply of gas other than for lighting and domestic use where this would involve the laying of a new main or an enlargement of the distribution works, except on such special terms as the Company may determine. Provision is made for arbitration on this question. Power is taken, with the approval of the Board of Trade and the Electricity Commissioners, to sell the whole undertaking, or separately to sell the electricity undertaking.

[*Parliamentary Agents: Messrs. Rees & Frères.*]

Scarborough Gas Company.

The Company seek power to issue stock for subscription by the public and to pay an underwriting commission. They may reserve not more than one-fourth of any future issue of stock for exclusive offer in the first instance to employees of the Company at a price not less than (*a*) the reserve price at which the cost of the issue is offered, or (*b*) the average price of recent sales of stock of the same class, whichever may be greater. Where stock is sold by tender, no preference shall be given to equal tenders except in the case of existing stockholders.

The obligation imposed by the Act of 1927 to introduce a Bill for the revision of the basic price is postponed from 1932 to 1942.

[*Parliamentary Agents: Messrs. Lewin, Gregory, Torr, Durnford, & Co.*]

South Suburban Gas Company.

The objects of this Bill are to transfer the undertakings of the Sevenoaks Gas Company and the Tonbridge Gas Company to the South Suburban Gas Company, and to authorize the erection of additional works and the raising of additional capital. Five per cent. preference stock of the South Suburban Company is to be issued in exchange for shares of the Sevenoaks Company, at the rate of £214 4s. for each ten "A" £10 shares, and £15 for each "B" £10 share. Five per cent. perpetual debenture stock is to be issued in exchange for 5 p.ct. Sevenoaks debenture stock at par. Five per cent. preference stock is to be issued in exchange for ordinary stock of the Tonbridge Company at the following rates: £2 16s. for each £1 of "A" stock; £2 4s. for each £1 of "B," "D," or "E" stock; £1 for each £1 of "C" stock. Five per cent. perpetual debenture stock of the South Suburban Company is to be issued in exchange for 4 p.ct. perpetual debenture stock of the Tonbridge Company at the rate of £1 for each £1 5s. of Tonbridge stock. Five per cent. redeemable debenture stock is to be issued in exchange for 5 p.ct. redeemable stock of the Tonbridge Company at par.

Provision is made for differential prices for gas supplied by ordinary meter in the following areas: In the Sevenoaks Urban District and the Parish of Seal, 1d. per therm in excess of the South Suburban rate; in the Parish of Riverhead, 1½d. per therm; in the remainder of the Sevenoaks district, 2d. per therm. In the main portion of the Tonbridge Urban District, the price shall not exceed 8½d. per therm, except to the extent to which the South Suburban rate exceeds 9½d. per therm. In the Wrotham Urban District and portions of the Malling and Tonbridge Rural Districts, the price may exceed by not more than 1·8d. per therm the rate in the Tonbridge Urban District, up to the limit of 16d. per therm. Gas supplied to the Tonbridge Urban District Council at the sewage works shall be charged at 1·2d. per therm below the ordinary local rates, and gas supplied to the Council elsewhere at 0·6d. per therm less than the ordinary rates. The calorific value of the gas supplied in the Sevenoaks and Tonbridge Districts shall continue unchanged.

There are provisions for compensating Directors of the Companies absorbed at a sum equivalent to seven times their fees for the year 1930, and to the Auditors at three times their fees. Officers of the two Companies are to be transferred to the South Suburban Gas Company on their existing rates of pay and general conditions. Officers not so transferred are to be compensated.

Provision is made for the use of land for gas purposes at the Waldo Brickworks, Bromley, at West Wickham, at Erith, and at Northfleet. Power is given to construct gas-works on the land already owned by the Company at Northfleet. Authority is sought to increase the capital of the Company by an amount not exceeding £212,395 5 p.ct. perference stock, and to raise further capital to a limit of £500,000. There is also included power to borrow on mortgage an amount not exceeding £1,035,498.

[*Parliamentary Agents: Messrs. Sherwood & Co.*]

[For Market Reports, see p. 842.]

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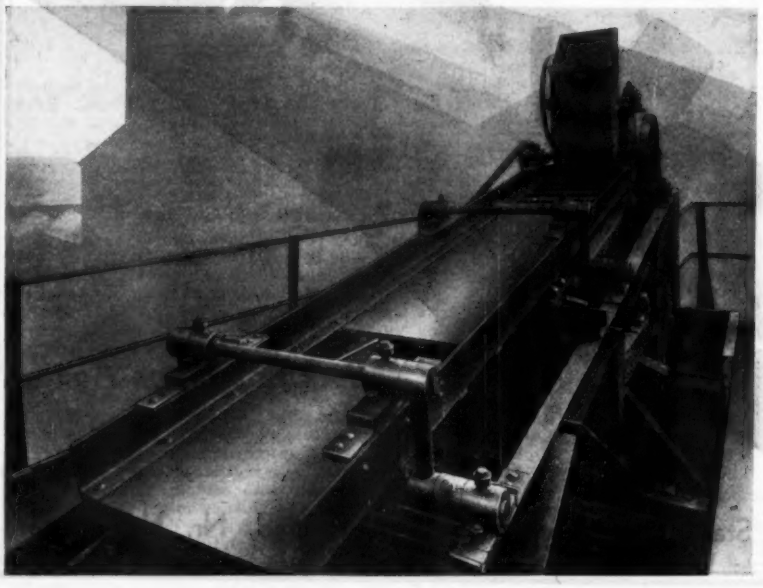

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STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see later pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Dec. 24. (Provincial Exchanges Dec. 18.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Oct. 5	7⅞	7⅞	Alliance & Dublin Ord. ...	100—105	...	103—104½
374,000	,,	July 9	4	4	Do. 4 p.c. Deb. ...	67—72	...	...
522,655	,,	Aug. 24	7	7	Barnet Ord. 7 p.c.	120—125	...	...
300,000	1	Oct. 19	1/9⅜	1/4⅛	Bombay, Ltd.	15/—17/6	...	...
174,500	10	Aug. 10	9	9	Bournemouth 5 p.c. ...	14⅜—15⅜	...	...
500,050	10	,,	7	7	Do. B 7 p.c. ...	12—13	...	...
439,160	10	,,	6	6	Do. Pref. 6 p.c. ...	10¼—11¼	...	...
50,000	Stk.	Dec. 14	3	3	Do. 3 p.c. Deb. ...	53—58*	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	73—78*	...	...
357,900	,,	Aug. 24	7½	7½	Brighton & Hove 6 p.c. Con.	114—119	...	116½—117
371,880	,,	,,	6¼	6¼	Do. 5 p.c. Con.	104—107	...	...
1,287,500	,,	July 23	5	5	Bristol 5 p.c. max.	88—90a	...	...
120,420	,,	June 25	4	4	Do. 1st 4 p.c. Deb. ...	78—80a	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	78—80a	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	99½—99½a	...	...
855,000	,,	Oct. 5	8	7	British Ord.	108—113	...	110½—111
100,000	,,	June 25	7	7	Do. 7 p.c. Pref.	110—115	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	70—75	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	92—97	...	...
160,000	,,	June 25	5	5	Cambridge 5 p.c. Deb. ...	92—97	...	...
100,000	10	Nov. 30	8	6	Cape Town, Ltd.	8⅜—9⅜	...	...
100,000	10	Oct. 30	4½	4½	Do. 4½ p.c. Pref. ...	6¾—7¼	...	...
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb. ...	65—70	...	69—70
626,860	,,	July 23	6	6	Cardiff Con. Ord.	95—98	...	...
237,860	,,	June 25	—	2⅜	Do. 5 p.c. Red. Deb.	90—95	...	...
157,150	,,	Aug. 10	6¼	5	Chester 5 p.c. Ord.	86—91b	...	...
98,936	1	Oct. 5	†2/-	2/-	Colombo, Ltd. Ord.... ...	27/—32/-	...	...
34,500	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	17/—19/-	...	...
609,204	1	Oct. 19	1/3'27	1/10'90	Colonial Gas Assn. Ltd. Ord.	10/—15/-	...	...
296,053	1	,,	1/5'67	1/2'54	Do. 8 p.c. Pref.	10/—15/-	...	...
2,073,280	Stk.	July 23	6	6	Commercial Ord.	92—95	...	...
475,000	,,	Dec. 14	3	3	Do. 3 p.c. Deb. ...	51—56*	...	...
787,560	,,	Aug. 10	7	7	Croydon sliding scale ...	107—110	...	...
453,100	,,	,,	5	5	Do. max. div.	81—84	...	82½
542,370	,,	Aug. 24	10	7	Derby Con.	120—125c	...	...
55,000	,,	June 25	4	4	Do. Deb.	65—70c	...	...
209,000	,,	Sept. 7	5	5	East Hull Ord. 5 p.c. ...	71—76	...	...
1,002,180	,,	Sept. 21	†6½	†4	European, Ltd.	95—105	—3	97—98
18,953,033	,,	July 23	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	17/6—18/6f	...	17/9—18/1½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	53—58	...	...
4,294,691	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	70—75	...	70—71½
5,694,095	,,	Dec. 14	3	3	Do. 3 p.c. Con. Deb. ...	52—57*	...	54—56
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	93—98*	...	93—94
2,500,000	,,	,,	—	4½	Do. 4½ p.c. Red. Deb. ...	85—90*	...	85—85½
161,480	,,	Sept. 7	10	10	Harrogate Cons. 10 p.c. max.	157—162	...	...
82,500	,,	Aug. 24	7	7	Hastings & St. L. 5 p.c. Conv.	95—100	...	...
258,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	80—85	...	...
70,000	10	9 Oct. '30	‡	10	Hongkong & China, Ltd. ...	12—13	...	...
213,200	Stk.	Aug. 10	6	6	Hornsey Con. 3½ p.c. ...	89—92	...	...
2,800,000	,,	Oct. 30	25	15	Imperial Continental Cap.	310—330	...	311—317
223,180	,,	Aug. 10	3½	3½	Do. 3½ p.c. Red. Deb.	70—75	...	...
235,242	,,	Aug. 10	8¼	8¼	Lea Bridge 5 p.c. Ord. ...	129—132	...	...
2,145,907	,,	Aug. 24	6	6	Liverpool 5 p.c. Ord. ...	96½—97½b	...	...
306,083	,,	July 15	4	4	Do. 4 p.c. Deb. ...	79—81b	...	...
165,736	,,	Aug. 24	9	8	Maidstone 5 p.c. Cap. ...	128—128	...	...
63,480	,,	June 25	3	3	Do. 3 p.c. Deb. ...	55—60	...	...
75,000	5	Nov. 30	†10	†10	Malta & Mediterranean ...	6¼—7	...	...
392,000	—	Oct. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	78—83	...	...
171,978	Stk.	Aug. 24	5	5	M. S. D. Utility "C." Cons.	76—81	...	...
522,992	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	67—72	...	...
675,000	,,	May 21	†6	†6	Montevideo, Ltd.	70—80	...	...
2,061,315	,,	Aug. 10	5⅜	5	Newcastle & Gateshead Con.	15/9—16/9d/	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	68—70d	...	...
691,705	,,	June 25	3½	3½	Do. 3½ p.c. Deb. ...	69—71d	...	...
277,285	,,	Oct. 30	5	5	Do. 5 p.c. Red. Deb.	96—98d	...	...
199,940	,,	Aug. 24	7½	7½	North Middlesex 6 p.c. Con.	105—110	...	...
396,160	,,	Aug. 10	5	5	Northampton 5 p.c. max. ...	74—79	...	...
800,000	,,	Nov. 30	7	9	Oriental, Ltd.	88—98	...	89—90
60,000	5	13 May, '15	—	—	Ottoman	0—¼	...	...
205,162	Stk.	June 25	8	8	Plym'th & Stonehouse 5 p.c.	110—115	...	...
424,416	,,	Aug. 24	8	8	Portsm'th Con.Stk. 4 p.c.Std.	119—124	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	76—79	...	...
686,312	,,	July 23	4	4	Primitiva 4 p.c. Rd. Db. 1911	83—86	...	...
389,813	,,	June 25	4	4	Do. 4 p.c. Cons. Deb.	84—87	...	...
150,000	10	Sept. 21	6	6	San Paulo 6 p.c. Pref. ...	7½—8	...	...
1,736,968	Stk.	Sept. 7	6¼	6	Sheffield Cons.	103—105e	...	...
95,000	,,	July 9	4	4	Do. 4 p.c. Deb.	79—81e	...	...
133,201	,,	Sept. 7	5	8½	Shrewsbury 5 p.c. Ord. ...	85—90	...	...
90,000	10	June 11	‡5	‡5	South African	3½—5½	...	...
6,709,895	Stk.	July 23	7½	5	South Met. Ord.	96—99	...	97
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	103—108	...	...
1,895,445	,,	July 9	3	3	Do. 3 p.c. Deb. ...	53—58	...	...
1,000,000	,,	July 23	4	5	Do. 5 p.c. Red. Deb.	93—99	...	94
91,500	,,	Aug. 10	8½	8½	South Shields Con.	108—110d	...	...
1,543,795	,,	Aug. 10	6¼	6¼	South Suburban Ord. 5 p.c.	101—104	...	...
668,837	,,	June 25	5	5	Do. 5 p.c. Deb.	92—97	...	...
647,740	,,	Aug. 24	5	5	Southampt'n Ord. 5 p.c. max.	76—79	...	...
121,275	,,	June 25	4	4	Do. 4 p.c. Deb.	70—75	...	...
250,000	,,	Aug. 24	7	7	Swansea 7 p.c. Red. Pref. ...	96—99	...	...
200,000	,,	June 25	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	...	...
1,076,490	,,	Aug. 10	6¾	6¾	Tottenham and District Ord.	103—107	...	...
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	93—98	...	...
199,005	,,	Dec. 14	4	4	Do. 4 p.c. Deb. ...	68—73*	...	...
85,701	,,	Sept. 21	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	72—77	...	...
310,694	,,	Aug. 24	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	100—105	...	...
86,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	85—90	...	89½—90
1,322,220	,,	July 9	7	7	Wandsworth and District: Consolidated	110—114	...	...
971,378	,,	,,	5	5	Do. 5 p.c. Pref.	90—95	...	...
1,167,964	,,	June 25	5	5	Do. 5 p.c. Deb.	94—99	...	93

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. * Ex. div. Paid free of income-tax. † For year. ‡ Div. ⇐ 10 p.ct. p.a. less tax and less tax on interim dividend.

(This announcement is inserted gratuitously.)

PETER—WITH ONE EXCEPTION

With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated, and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

THE CHAIRMAN,

SCHOOL FOR THE BLIND

(Founded 1838),

Swiss Cottage, LONDON, N.W. 3

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see earlier page.]

A general lack of support, accentuated each day by the approach of the Christmas holidays, caused a further falling off in prices in most sections of the Stock Exchange last week. There were, however, a few bright spots towards the close. Gilt-edged stocks received a stimulus on the Young Plan Committee's report and, headed by War Loan prices, strengthened, while the result of the Australian election made a very good impression on the House, though in the absence of buyers prices did not respond to the extent they might have done in more normal times.

The Gas Market was no exception to the general trend of events, and comparatively little business was recorded. Prices of transactions were in most cases comparable with the previous week's level, though Brighton 6 p.ct. at 117 and Uxbridge 5 p.ct. preference at 90 showed a harder tendency. The only quotation affected was that of European ordinary, which fell 3 points to 95-105. The value of this stock has varied considerably during the year, and at one time depreciated to as low as 85, but it is interesting to note that the present quotation is the same as at the close of 1930.

Current Sales of Gas Products.

The London Market for Tar and Tar Products.

LONDON, *Dec.* 28.

The values of tar products remain unchanged, and are as follows:

Pitch is from 70s. to 75s. per ton f.o.b.

Creosote, for export, varies from 3¾d. to 5d. per gallon f.o.b., according to specification.

Pure toluole is firm at about 2s. 7d. to 2s. 8d. per gallon; pure benzole is 1s. 8d. to 1s. 9d. per gallon; 95/160 solvent naphtha about 1s. 6d. per gallon; and 90/140 pyridine bases about 4s. per gallon.

Tar Products in the Provinces.

Dec. 28.

The average prices of gas-works products during the week were: Gas-works tar, 22s. to 26s. Pitch—East Coast, 55s. to 56s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 55s. to 56s. f.o.b.* Toluole, naked, North, 1s. 8d. to 1s. 8¼d. Coal-tar crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 11d. to 11¼d. Creosote, *ex* works, in bulk, North, liquid and salty, 3¼d. to 3½d.; low gravity, 1¼d.; Scotland, 3¼d. to 3½d. Heavy oils, in bulk, North, 5d. to 5¼d. Carbolic acid, 60's, 1s. 6½d. to 1s. 7d. Naphthalene, £9 to £10. Salts, 50s. to 70s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Dec.* 26.

Very little new business has been concluded during the week, but distillers maintain their quotations at previous levels. Best grades of creosote oil continue rather scarce in this area.

Pitch.—Market remains firm at 60s. to 62s. 6d. per ton f.o.r. works in bulk for home trade. Export price is nominal at 60s. to 65s. per ton f.o.b. Glasgow.

Refined tar to Ministry of Transport Specification is beginning to attract attention for forward delivery, and value is firm at 4d. to 4½d. per gallon f.o.r. works naked.

Creosote oil.—Owing to scarcity prices have increased fractionally. B.E.S.A. Specification is 3d. to 3¼d. per gallon; low gravity, 3¼d. to 3¾d. per gallon; and neutral oil, 3½d. to 3¾d. per gallon—all in bulk *ex* works.

Cresylic.—The position remains quiet with prices easy. Pale, 97/99 p.ct., 1s. 2½d. to 1s. 3½d. per gallon; dark, 97/99 p.ct., 1s. 1¼d. to 1s. 2¼d. per gallon; and pale, 99/100 p.ct., 1s. 4½d. to 1s. 5d. per gallon—all f.o.r.

Crude naphtha.—Value is unchanged at 4½d. to 5d. per gallon f.o.r. works, but supplies are scarce.

Solvent naphtha.—Quotations are weak. 90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 grade 1s. to 1s. 1d. per gallon.

Motor benzole.—With very little movement in this product value is easy at 1s. 3d. to 1s. 4d. per gallon *ex* works in bulk quantities.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	7	to	0	7½	per gallon at works
Motor "	1	2	"	1	3	" " "
Pure "	1	6	"	1	7	" " "

New Capital Issues.

Godalming Gas and Coke Company, Ltd.—The tenders for the £5000 6 p.ct. debentures of this Company were opened on Dec. 21. They amounted to a total of £14,200, and ranged from £103 10s. per £100 down to the minimum of par. The lowest successful tender was at £100 5s. per £100, the average price obtained being £100 16s. 8d. p.ct.

Trade Notes.

Solent Engineering Company, Ltd.

Having acquired more commodious premises, the Solent Engineering Company, Ltd., of Southampton, tube specialists, inform us that after Jan. 1, 1932, their address will be 71, High Street, Southampton; telephone, No. 3526, as before.

Diaries, Calendars, &c., Received.

Acknowledgment is made of the receipt from the following friends of seasonable gifts in the form of diaries, calendars, &c.:

British Jeffrey-Diamond, Ltd., Stennard Works, Wakefield.
Chancery Lane Printing Works, Ltd., Plough Court, Fetter Lane, London, E.C. 4.
Clay Cross Company, Ltd., Clay Cross, near Chesterfield.
Cookers and Geysers, Ltd., 244, High Holborn, London, W.C. 1.
W. C. Holmes & Co., Ltd., Whitestone Ironworks, Huddersfield.
Mountsorrel Granite Company, Ltd., Welford House, Welford Place, Leicester.
Simon-Carves, Ltd., Cheadle Heath, Stockport.
Westwood & Wrights, Ltd., Brierley Hill, Staffs.

Fuel Engin. Library
Registered as a Newspaper.
JAN 15 1932

GAS JOURNAL

HIGH HEAT POWER BY-PRODUCTS

Vol. 196. 83rd Year. | LONDON, DECEMBER 30, 1931. | No. 3580. Price 1s.

OXIDE OF IRON
SPENT OXIDE
Gas Purification & Chemical Co.
— LTD. —
PALMERSTON HOUSE, LONDON, E.C. 2

SPECIFY
ALDER & MACKAY
GAS METERS
FOR ALL PURPOSES
ALDER & MACKAY LTD
EDINBURGH · LONDON · AND · BRANCHES

"LUX"
Purifying Material from STOCK.
THOS. DUXBURY & CO.,
16, Deansgate, Manchester.
Palace Chambers, Westminster, S.W. 1

Torbay PAINT
TORBAY PAINT Co., Ld.,
26/28, Billiter St., London, E.C.3.

"BLUEBELL"
SILICA RETORTS
(*95% SILICA*)
JOHN G. STEIN & Co., Ltd.,
Castlecary, SCOTLAND.

HOLMES
HUDDERSFIELD.
See p. 845 for this week's announcement.
Previous Announcement December 23.

GAS WORKS PLANT
ASHMORE, BENSON, PEASE & Co. Ltd.
STOCKTON-ON-TEES
SEE ILLUSTRATED ADVT. LAST WEEK PAGE 764.

FERRODOR
PAINT
APPLIED IN 1902
STILL IN GOOD CONDITION IN 1931
GRIFFITHS BROS. & Co. LONDON Ltd.
Paint, Enamel, and Insulating Varnish Manufacturers
BERMONDSEY, S.E. 16

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
Astor House, Aldwych, London, W.C.2.
Guildhall Chambers, Sandhill, Newcastle-on-Tyne.
24, Chapel Street, Liverpool.
ESTABLISHED 1840.

COWAN'S METERS
See Advertisement on page III. of Wrapper.

GAS WORKS INSTRUMENTS.
ALEXANDER WRIGHT & Co LTD
1, WESTMINSTER PALACE GARDENS, VICTORIA STREET.
Telephone. VICTORIA 1207. WESTMINSTER. S.W.1 Telegrams: PRECISION, SOWEST, LONDON
See displayed advertisement last week p. IX.

DEMPSTERS MANCHESTER
DESIRABLE DEPENDABLE AND DURABLE
HEAD OFFICE: GAS PLANT WORKS MANCHESTER
LONDON OFFICE: 34, VICTORIA ST. S.W.1.

Adverts. of Radiation LIMITED
See Pages
813 & Centre IV., V.

ROBERT DEMPSTER & SONS LTD.
GAS ENGINEERS
ELLAND

METRO DISINFECTANT FLUID

A HIGHLY CONCENTRATED TAR ACID EMULSION,
MISCIBLE WITH SOFT, HARD OR SEA-WATER.

5 GALLON DRUM 22/6

carriage paid Great Britain

METRO BLACK VARNISH

A PROTECTIVE COVERING FOR ALL OUTDOOR IRONWORK—TO DRY QUICKLY WITH A GOOD HARD GLOSS.

Manufacturers:

SOUTH METROPOLITAN GAS COMPANY,
709, OLD KENT ROAD, LONDON, S.E.15.

Phone: New Cross 2000 'Grams: "Metrogas, Peck, London"

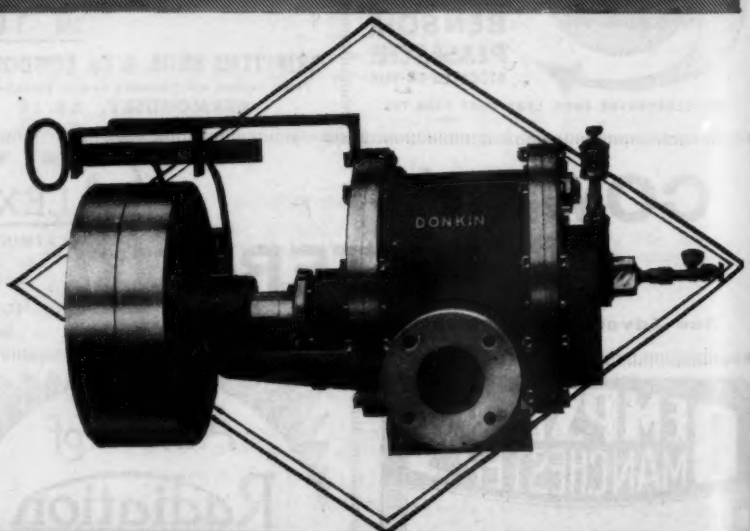
Donkin Pressure Blowers and Exhausters

This type of machine is particularly simple, silent, and universal.

Simple, because it has no valves and few working parts. It works silently and is totally enclosed.

Universal in its application to operations in Oil and Soap Works, Chemical Works, and for White Lead manufacturing. It pumps gas or will exhaust gas; will force air through liquids for aerating, agitating or mixing.

Donkin Pressure Blowers and Exhausters maintain a high rate of efficiency with practically no special attention.



The BRYAN DONKIN CO. LTD.

Engineers and Ironfounders
Head Office & Works, CHESTERFIELD.

GAS JOURNAL

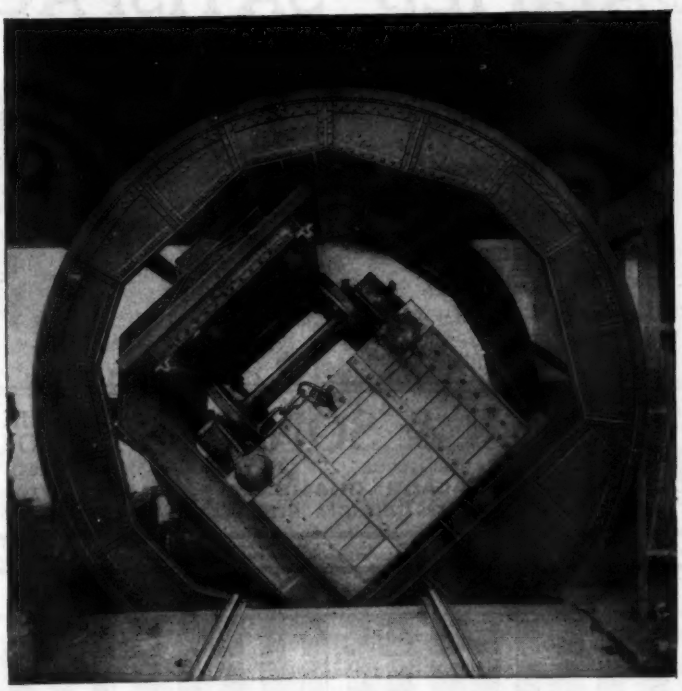
LIGHT . HEAT . POWER . BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. 196. 83rd Year. LONDON, DECEMBER 30, 1931. No. 3580. Price 1s.

WAGON TIPPLERS

MECHANICAL HANDLING PLANT FOR ALL CLASSES OF MATERIAL



TELPHERS

SKIP HOISTS

SCREENS OF VARIOUS TYPES

TRUCK TIPPLERS

SKIP FILLERS

CONVEYORS ETC.

MANUFACTURED BY:—

STRACHAN & HENSHAW, LTD.

WHITEHALL IRONWORKS, BRISTOL.

GEORGE GLOVER'S NEW PRE-PAYMENT METER

"CHELSEA TWO"

PENNIES and SHILLINGS.

This new meter takes both coins without altering the mechanism in any way.

The "Chelsea Two" effects an appreciable saving in working expenses. It reduces capital outlay and eliminates the trouble and time involved in changing Meters (whether of the fixed coin or convertible type) to enable them to take coins of another denomination.

Also made to take Pennies, Sixpences and Shillings.

GEORGE GLOVER & CO., LTD.

Dry Meter Manufacturers and Repairers,

RANELAGH WORKS, Chelsea, London, S.W. 3.

Phone: Sloane 7257—7258. Wires: "Dry Meters Phone, London."

Branches: Ranelagh Meter Works, East Park View, LEEDS.

City Meter Works, Port Street, MANCHESTER.

BACKED BY OVER **50 YEARS'** EXPERIENCE, OUR

COKE BREAKERS

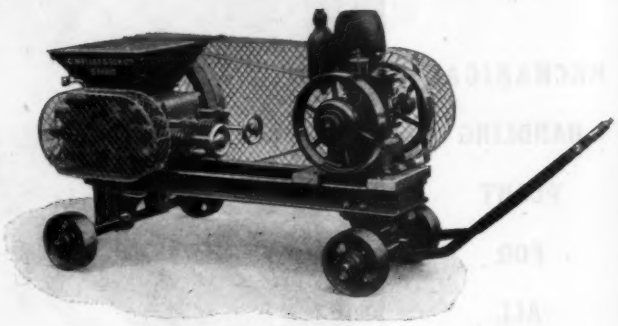
(Like our EXHAUSTERS and COMPRESSORS)

MAY BE RELIED ON TO GIVE

UNQUALIFIED SATISFACTION

Our Range of Designs includes large Machines incorporating Elevating and Screening Plant as well as small Portable Machines of the type illustrated.

This Breaker has a capacity of 5 tons per hour and can be driven by Gas or Petrol Engine, or Motor.



GEO. WALLER & SON, Ltd. PHŒNIX IRON WORKS, STROUD, GLOS.

Telegrams: "WALLER, BRIMSCOMBE." Telephone: 10 BRIMSCOMBE.

LONDON OFFICE: 149-150, PALACE CHAMBERS, S.W. 1. Telephone: 9476 VICTORIA.

AGENTS FOR SCOTLAND - MESSRS. MILNE & MITCHELL, 75, BATH STREET, GLASGOW C.2.

F. TURNER (ART-METAL) LIMITED

The well-known Makers of Gas-Fire Surrounds

Wish their Customers and Trade Friends a Prosperous New Year, and look forward throughout 1932 to a continuance of the cordial relations existing.

61-63, SUMMER HILL ST., BIRMINGHAM

Buy British in 1932

RELIABILITY

The lighthouse must be reliable, so much depends upon its timely warning. The Alder & Mackay Gas Meter is reliable—it is built from the finest materials by the most skilled workmanship. May we send you detailed particulars?

ALDER & MACKAY LIMITED

ALDER & MACKAY LTD., EDINBURGH, LONDON & BRANCHES.

SILICA RETORTS.

MINIMUM EXPANSION
The Oughtibridge Silica Firebrick Co., Ltd.
Oughtibridge, Near Sheffield.
Estd 1858.

WE UNDERTAKE TO MANUFACTURE SILICA BLOCKS TO ANY SPECIFICATION REQUIRED.

COKE OVEN BLOCKS.

THE

"PARKINSON"

"MOR-LITE"
PATENT
DIRECTIONAL REFLECTOR

Polished "Staybrite" Steel

No. 840 Type "G"

No. 840 Type "U"

Unbreakable

Adjustable

Instantly

Fixed

INCREASED ILLUMINATION
No Extra Maintenance Cost

SAMPLES on APPLICATION

W. PARKINSON & CO.
INCORPORATED IN PARKINSON & COWAN (GAS METERS), LTD.

BELL BARN ROAD, BIRMINGHAM.
COTTAGE LANE, CITY ROAD, LONDON, E.C. 1.
RAPHAEL STREET, CROMAC STREET, BELFAST.

May be fitted with Directional Reflector.

Efficiency with Economy.

Maintenance Simplified.

KEMPTON'S LAMPS FOR PUBLIC LIGHTING.

Exact replica of Lamps that are being fitted in some of the important Main Thoroughfares in London Boroughs.

Lighting Engineers are cordially invited to inspect, by appointment, these excellent installations.

Prices on Application—Sample without obligation.

C. H. KEMPTON & Co. LTD.

Stangate House,
235, Westminster Bridge Road, London, S.E. 1

'Phones: Hop 3743, 5535. Wires: Kemtomant, London.

WORTHINGTON

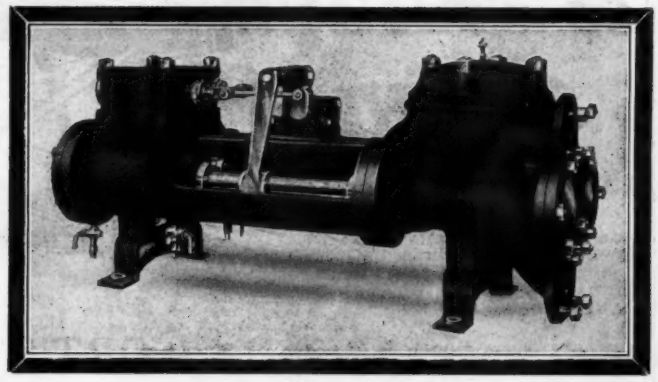
PUMPS FOR THE GAS INDUSTRY

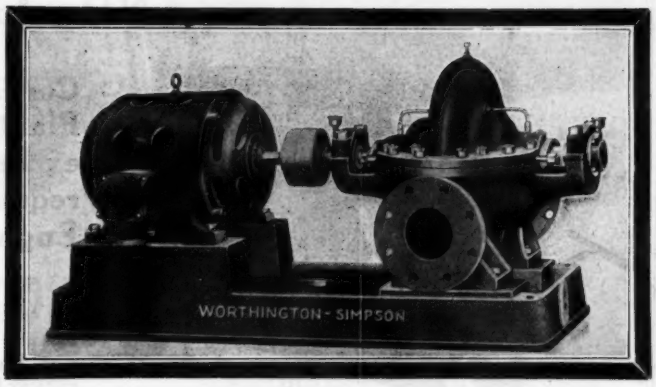
WORTHINGTON-SIMPSON PUMPS are built for all capacities, and for all duties in the Gas Industry. Write for complete technical data.

WORTHINGTON

PRODUCTS

PUMPS
Centrifugal, Steam and Power
COMPRESSORS
VACUUM PUMPS
SEWAGE PUMPS
PUMPING ENGINES
GAS ENGINES
CONDENSERS
COOLING TOWERS
FEED WATER HEATERS
EVAPORATORS
METERS
Literature on request





WORTHINGTON-SIMPSON offer the Gas Industry a line of pumping units that can be relied upon to fulfil every requirement for dependable and economical operation. For the efficient handling of process solutions, for boiler feed and general service, where reliability, long life and low maintenance costs are essentials, these pumps live up to the WORTHINGTON-SIMPSON reputation for consistent, trouble-free, low-cost performance. Advanced design and rugged construction give the extra stamina that counts for much in these exacting services.

Works:
NEWARK-ON-TRENT.

WORTHINGTON-SIMPSON, LTD.,

TELEPHONES 4271 HOLBORN (5 Lines).

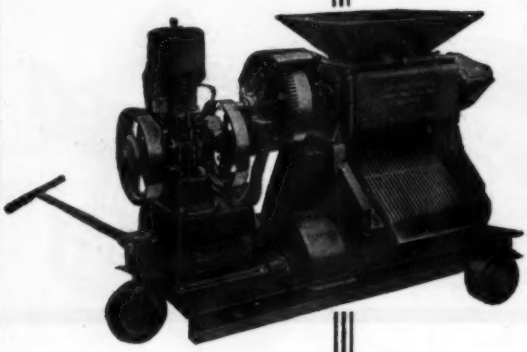
QUEEN'S HOUSE, KINGSWAY, LONDON, W.C.2.

CABLES AND TELEGRAMS: "PUMPING, WESTCENT, LONDON."

Supremacy

FLIGHT-LIEUT. BOOTHMAN WINNING THE SCHNEIDER TROPHY OUTRIGHT FOR GREAT BRITAIN ON SUNDAY SEPT. 13TH, 1931.

CORT'S COKE CUTTING AND GRADING PLANT



Cort's Coke Cutting and Grading Plant is the outcome of long experience in supplying the requirements of discriminating Engineers. It is

100 °/o VALUE,

not built down to a price, but designed rather to create a standard of quality above competition.

Special attention has been given to the countering of the abrasive and corrosive action of coke wherever it is in contact; thus ensuring the maximum of service at the minimum of Cost for upkeep over long uninterrupted periods.

We appeal to Engineers considering the installation of Coke Handling Plant to bear in mind the foregoing points—and it may be opportune to quote John Ruskin :—

"There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper, and the people who consider price only are this man's lawful prey."

ROBERT CORT & SON, LTD.
Reading Bridge Iron Works
READING

Agents for North of England: Messrs. ROBT. BOWRAN & CO, LTD., 4, St. Nicholas Buildings, Newcastle-on-Tyne.

LOOK AT YOUR PASS-BOOK

Let "Company 256" tell you why it now uses I.V.W's. The Avery scale for checking wholesale quantities saves 2 lbs. 2 ozs. in every cwt. manufactured and sold." This saving of overweight means 1/5d in every hundredweight. CAN WE DO THE SAME FOR YOU? Write to the I.V.W. Service Dept. W 1514 W. & T. Avery, Ltd., Soho Foundry, Birmingham

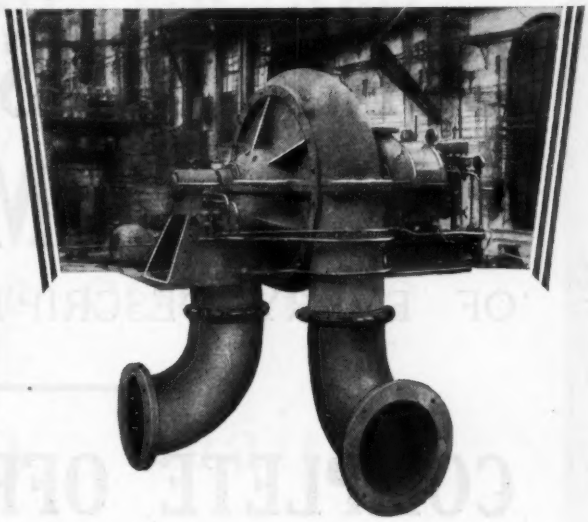
LOOK AT YOUR SCALES

AVERY

B T-H

Exhausters Boosters & Blowers

Motor and Turbine driven.



The illustration shows a B.T.H. turbine-driven Single Stage Gas Exhauster, rated at 750,000 cu.ft. per hour, 5,800 r.p.m., 60 in. Water Gauge pressure rise.

Smooth operation.—A special design of the impeller and discharge rings ensures a very flat pressure volume characteristic, giving a wide range of satisfactory operation.
All bearings are pressure lubricated.

Ease of Inspection.—Casings are split on the horizontal centre line, and bearings and sealing glands have separate caps to facilitate inspection.

Low maintenance costs. — Careful design has reduced maintenance costs to a minimum.

Exhausters, Boosters and Blowers of similar design are giving reliable service in many Municipal and Industrial Plants.

Write for particulars.

The British Thomson-Houston Co. Ltd.

ELECTRICAL ENGINEERS AND MANUFACTURERS.

Head Office - - - - - - - - - Rugby.
London Office - - - - "Crown House," Aldwych.
Works - Rugby, Birmingham, Willesden, Coventry, Chesterfield.

A1088N

THE

GAS METER

COMPANY, LTD.

MANUFACTURERS OF

CONSUMERS AND STATION GAS METERS

OF EVERY DESCRIPTION AND CAPACITY.

COMPLETE OFFICIAL TESTING INSTALLATIONS.

THE LONDON CLOCK CONTROLLER.

PRESSURE GAUGES, MAIN COCKS, THERMOMETERS.

For particulars write to:—

238, KINGSLAND ROAD, LONDON, E. 2.

ALSO AT **OLDHAM, DUBLIN, & MANCHESTER.**

It

becomes increasingly obvious that the old fashioned vertical gas fire cannot compete indefinitely against the

INCLINED GAS FIRE

Cannon Iron Foundries Ltd., Deepfields, Nr. Bilston, Staffs. London Office and Showrooms: Bath House, 57/60, Holborn Viaduct, E.C. 1.

Pressure Troubles

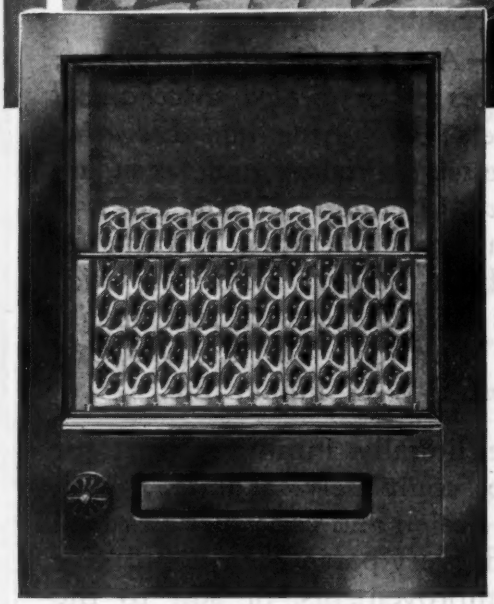
Inadequate House Services

Cost of Installation of New Mains

Complaints

Prejudices

Competition of Electricity



The Davis "PANELLA" *Gas Fire.*

THE "Panella" Gas Fire, being perfectly plain in design and having no projecting trivet or fender, will harmonize with any decorative scheme and lend itself to any treatment of the fireplace. Provided there is a satisfactory flue arrangement, it need not be fixed at the floor level. It can be raised a foot or more from the ground; it requires no hearth to rest upon.

The burner is of a modern design. It burns silently. In the No. 10 and No. 12 size of the fire, the burner is of the duplex type, so that, adjusted only by the one tap, the whole of the fire or the centre radiants only can be used to give the degree of warmth desired.

Send for Illustrated Price Lists.

The DAVIS GAS STOVE Co. LTD.

60, OXFORD STREET, LONDON, W.1

Works: LUTON

(Radiation Ltd., Proprietors)

HUMPHREYS & GLASGOW LTD.

Fortieth Anniversary

In 1932 HUMPHREYS & GLASGOW LTD. complete Forty Years of Carburetted-Water-Gas Development.

THIS FORTIETH ANNIVERSARY is happily distinguished by the fact that Humphreys-Glasgow New Standards for 1932 express the *Broadest Advance* in the history of Carburetted-Water-Gas Development.

During 1930-31 Humphreys & Glasgow Ltd. have concentrated their Technical Staff, in intensive collaboration with their American and Continental Associates, upon the Comprehensive Improvement of all of their Processes and Plants—with this revolutionary culmination for 1932:

MAJOR IMPROVEMENTS in—Annular Generator Boilers; Water-Sealed Self-Clinkering Generators; Dry-Sealed Mechanical Generators; Automatic Coke Chargers; Conveying and Elevating Plant; Carburetting Processes and Vessels; Primary and Secondary Blasting Processes; Safety Mechanical Operators for all Sizes of Plants; Centralized Control of Advanced Operating Technique; Blowing Plant; Condensers; Waste-Heat Boilers; Reforming Rich Gases to suit Standard Requirements; Special Gases to suit Special Requirements; Gasification of Heavy Fuel Oil, Tar, Creosote, and Effluent Liquor; Complete-Gasification C-W-G Plant; Etc.

LESSER IMPROVEMENTS are literally innumerable; for Humphreys & Glasgow Ltd. have completely analyzed, both mechanically and metallurgically, the design and construction of all of their Plants, and have re-designed every part which could give better effect to their new Process Improvements, or add to the efficiency life convenience or safety of their Plants.

HUMPHREYS & GLASGOW LTD. submit that this Great Concentration of Improvements for **1932** constitutes still another H & G Revolution in C-W-G Manufacture, which appropriately celebrates the completion of their *Forty Years of Service to the Gas Industry,* and fully justifies the unanimous preference for their Plants—in the future as in the past!

H & G Installations in the British Empire are exclusively British in both materials and labour—while incorporating World-Wide knowledge and experience. H & G have altogether 129 Patents in force or applied for in the United Kingdom alone.

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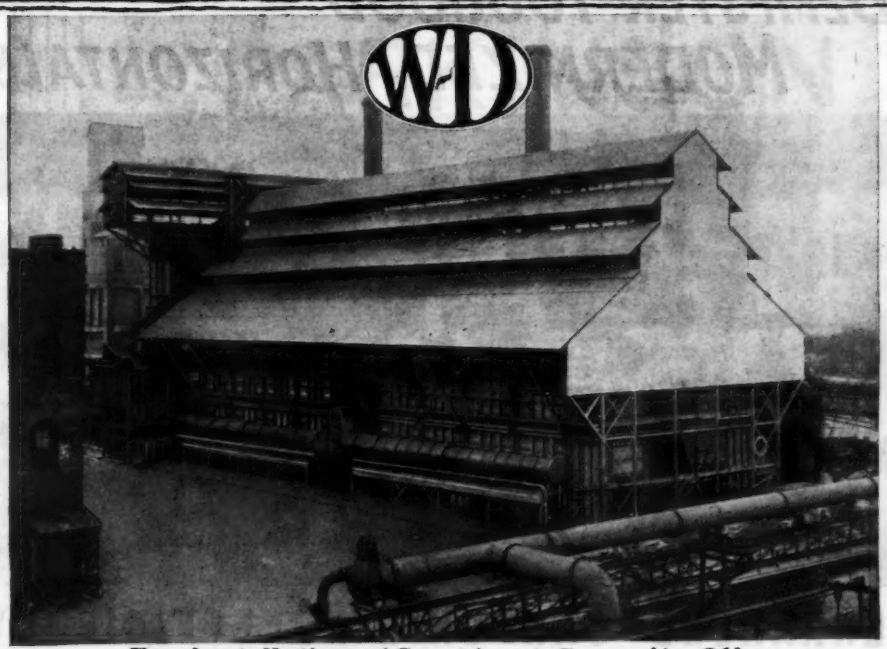

Two Installations (Combined Capacity 9½ million Cu.Ft. per day) erected at the Southall Station, Gas Light & Coke Company

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INTERMITTENT VERTICAL CHAMBERS

AS DESIGNED & ERECTED BY

THE WOODALL-DUCKHAM COMPANY

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344 PLANTS installed throughout the World
Capacity **194,000,000** cu.ft. of gas per **24** hours.

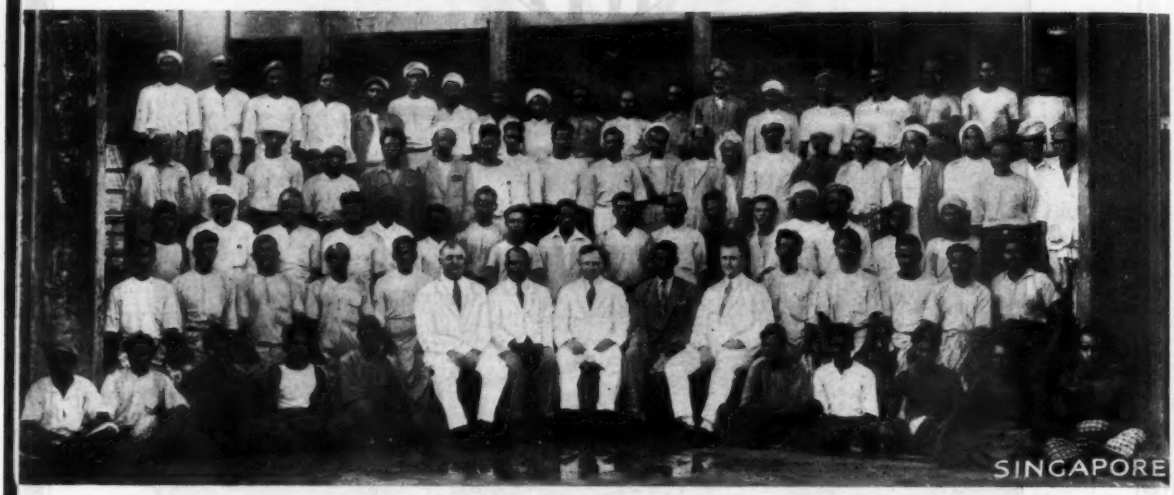
10 PLANTS in the United Kingdom
Capacity **23,600,000** cu.ft. of gas per **24** hours.

58 PLANTS ordered during past two years
Capacity **31,140,000** cu.ft. of gas per **24** hours.

THE WOODALL-DUCKHAM VERTICAL RETORT AND OVEN CONSTRUCTION Co.(1920) LTD.

ALLINGTON HOUSE, 136-150 VICTORIA STREET. LONDON. S.W.1.

"DEMPSTER-TOOGOOD" MODERNIZED HORIZONTALS



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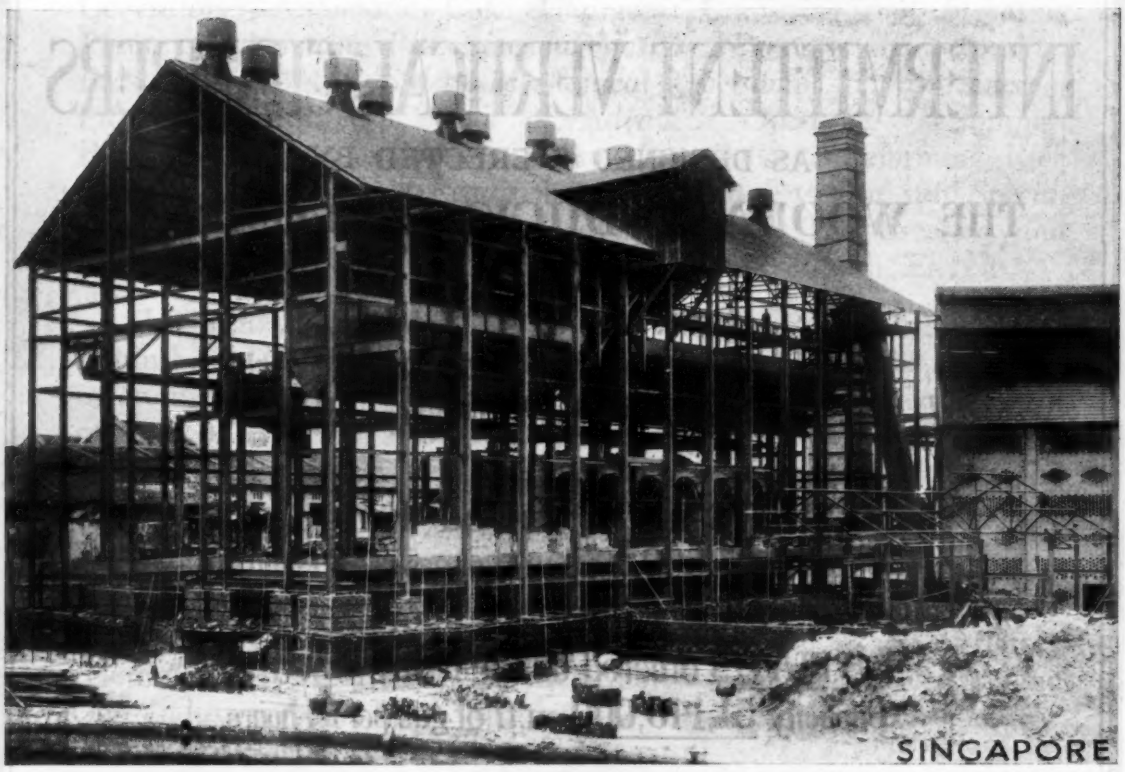

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PARKINSON

COSIE

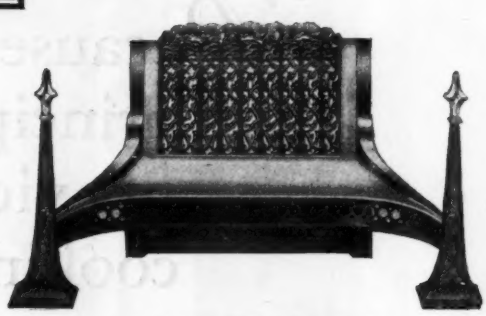
FIRES

The Cosie Fire in a modern setting.

The COSIE FIRE is designed to fit in front of an ordinary coal grate without detracting from its distinctive features.

Alternative Fenders of attractive types give this Fire a wide range of adaptability.

Its special construction, combined with the well-known SUNRAY Radiants, ensures the most effective heat distribution.



Cosie Fire fitted with H-type Fender.

The COSIE FIRE is constructed in 7 to 11 Radiant sizes to suit grate openings of 12 in. to 17½ in. wide.

It requires no special fitting, as it is only necessary to trim the sheet metal fuel support at the back.

Plain or Dog Fenders are available, and either Swing Trivet or Side Swing Boiling Burners can be fitted to all COSIE FIRES.

For Catalogue describing these fires, write:

THE PARKINSON STOVE CO., LTD.

STECHFORD BIRMINGHAM

London Showrooms:
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And at Manchester,
Glasgow, Belfast, Dublin,
and Wellington, N.Z.

THE PARKINSON STOVE CO. (AUSTRALIA) LTD.
Melbourne, Sydney, and Perth, W.A.

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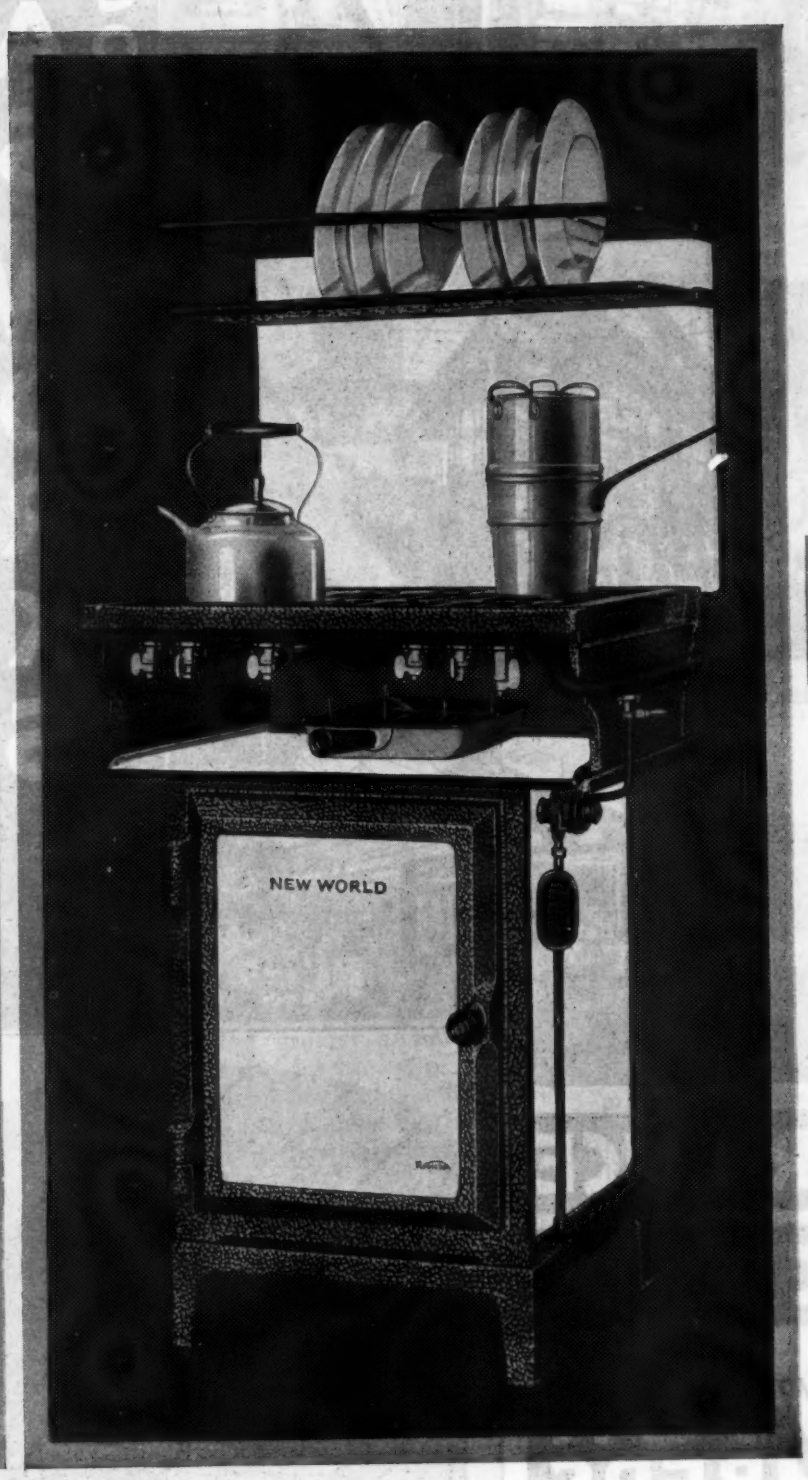
COOKER

with the 'REGULO' control

Because the "New World" principle of oven design provides facilities for cooking the whole dinner –even up to six courses–at one operation, "Regulo" cooking has no near rival.

Radiation
LIMITED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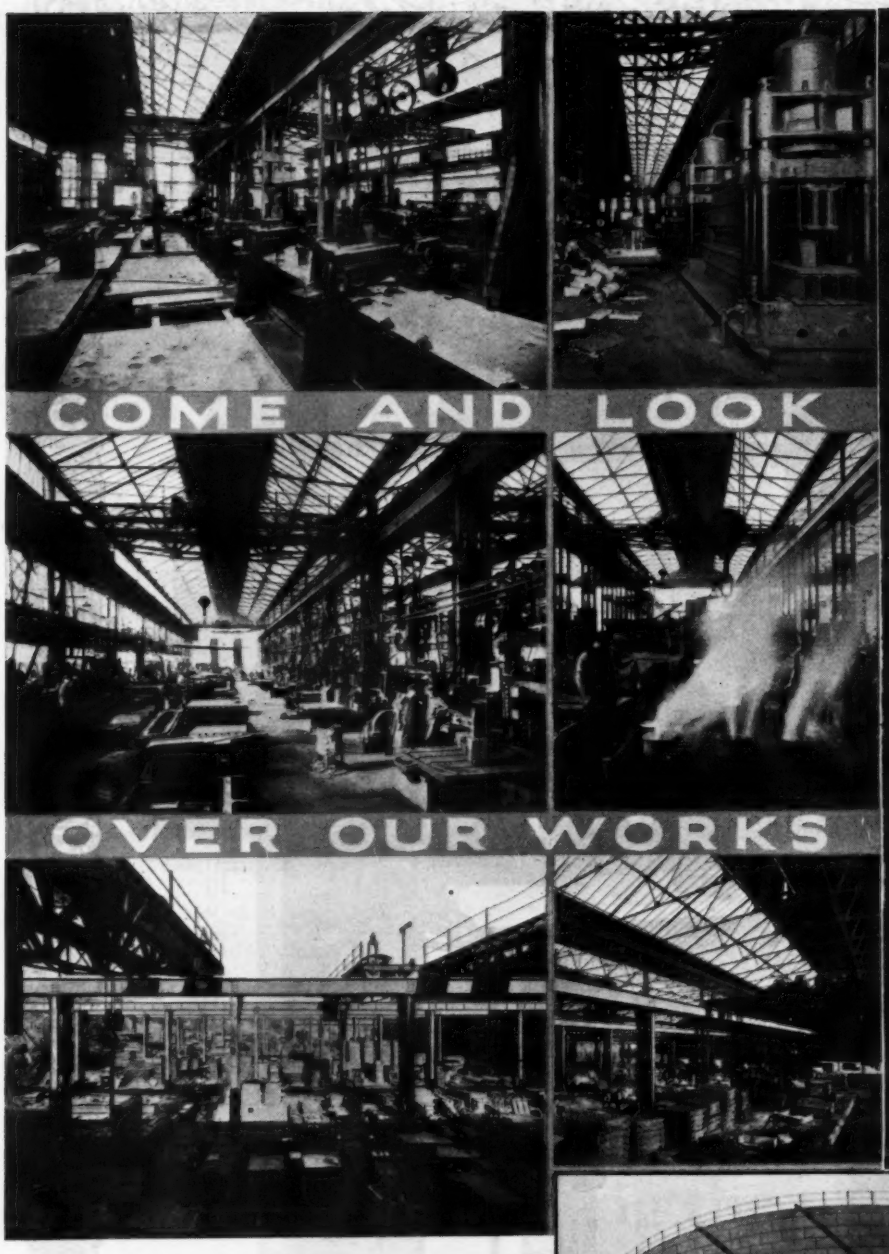

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EXPERIENCE
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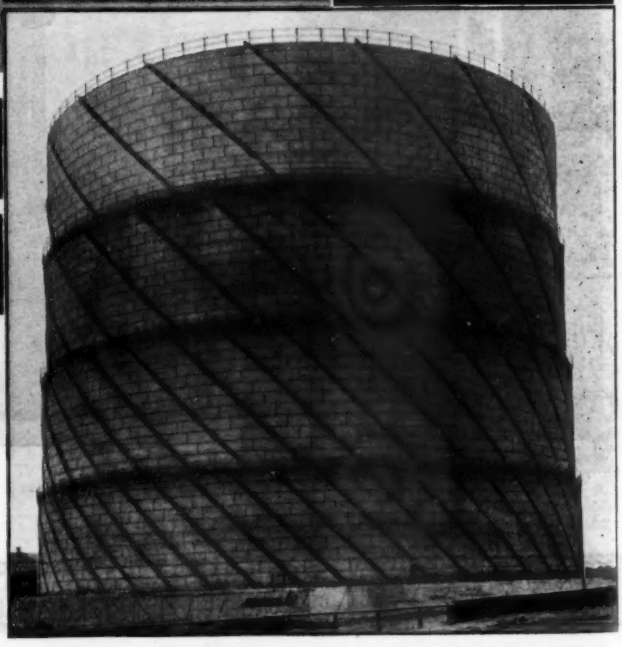
NEWTON CHAMBERS THORNCLIFFE
Near Sheffield
EXPERIENCE ESTD 1793 EFFICIENCY



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Steamless Gas-Heated Radiator.

Unexcelled for Efficiency and designed to reduce maintenance costs

THE UNIMAIN abolishes all the troubles you have previously experienced with Radiators, because it is a complete departure from any existing type in design, construction, and performance.

The larger area of its tubes and the greater air-intake enhance the certainty of perfect and complete combustion and obviate condensation troubles. Variable district pressure does not affect it.

The UNISTAT Automatic Control with which it is fitted, is set for correct surface temperature and allows for exceptional conditions. It has a generous margin of adjustment for individual requirements, which can be attended to while the burner is alight.

In the UNIMAIN Radiator every little point has had the fullest consideration — it has smooth exterior surfaces and enamelled inner tubes for easy cleaning—it has brass screws for dismantling to obviate rust or clogging—it is economical in gas consumption—low in initial cost — and will give a long life of good service with practically no maintenance.

Every part is accessible and the Radiator can be dismantled completely for cleaning or overhaul in 5 minutes by an unskilled labourer—without disconnecting the gas supply.

The UNIMAIN Radiator is obtainable in 2, 4, and 6 tube sizes, and in heights of 33 and 40 ins. Stands for the Reduced types and "Linopads" to prevent fraying the floor covering can be supplied if desired.

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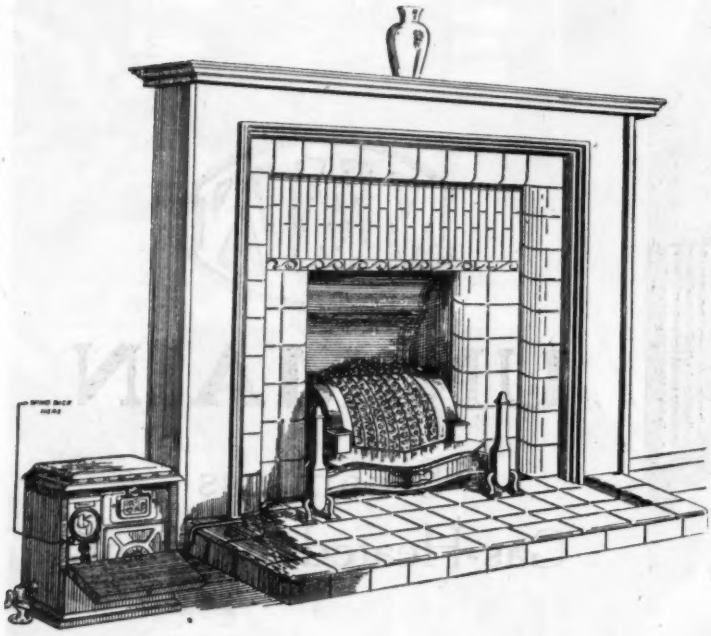
A VULCAN "COMFY" GAS FIRE and a WILLEY METER make up



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A meter is never more welcome than when it is a means of providing radiant heat in a cheerless apartment. Such installations are profitable to all concerned, to the Gas Undertaking, the Hotel Proprietor and his Guest.

DON'T HESITATE

Let us quote for complete installations

WILLEY & Co., Ltd.

Makers of Everything for Gas

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AT HOME AND ABROAD

BRADDOCK'S METERS

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(*See advertisement, Dec. 9, p. 649.*)

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Apply, with *copies* of recent Testimonials, stating Age, Qualifications, and previous Experiences, together with Salary required, to the SECRETARY, GAS COMPANY, HIGH STREET, BRIDGWATER.

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BOROUGH OF MANSFIELD.

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Particulars of the Oil quoted for should be given.

Tenders, sealed and endorsed "Tenders for Gas Oil," to be delivered to the undersigned on or before Monday, the 11th of January, 1932.

The Corporation do not bind themselves to accept the lowest or any Tender.

A. C. SHEPHERD,
Town Clerk.

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Including Rates, Heating, and Lift Service.
For facilities to view apply HOUSEKEEPER, VICTORIA STATION HOUSE, S.W. 1.

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1¼in. to 12in. BORE.
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MOST MODERN "DISH-END" TYPE
WITH CORRUGATED SECTIONS.

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Two 30 ft. × 8 ft. 6 ins. ×	160 lbs.	6970/1
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One 30 ft. × 8 ft. 3 ins. ×	160 lbs.	7054
One 30 ft. × 7 ft. 6 ins. ×	120 lbs.	6945
Two 24 ft. × 6 ft. 6 ins. ×	150 lbs.	6974/5
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All the above Boilers are built from "Siemens Martin" Acid Steel.
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SUPERHEATERS AND PIPEWORK INSTALLATIONS.
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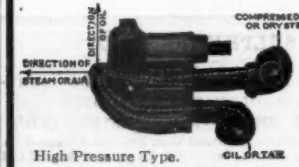

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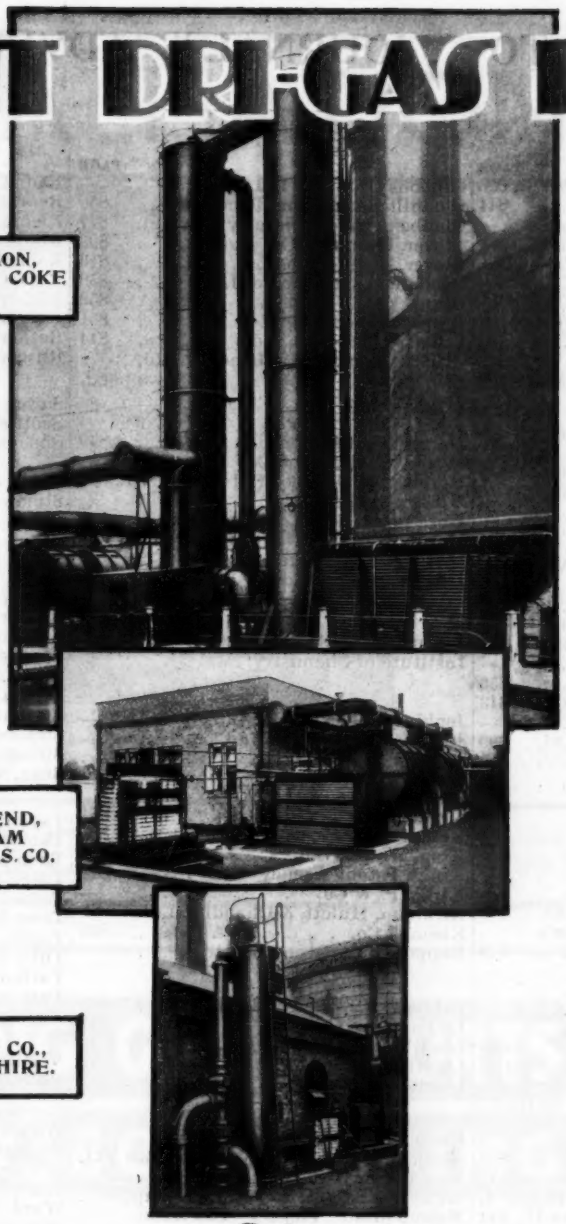

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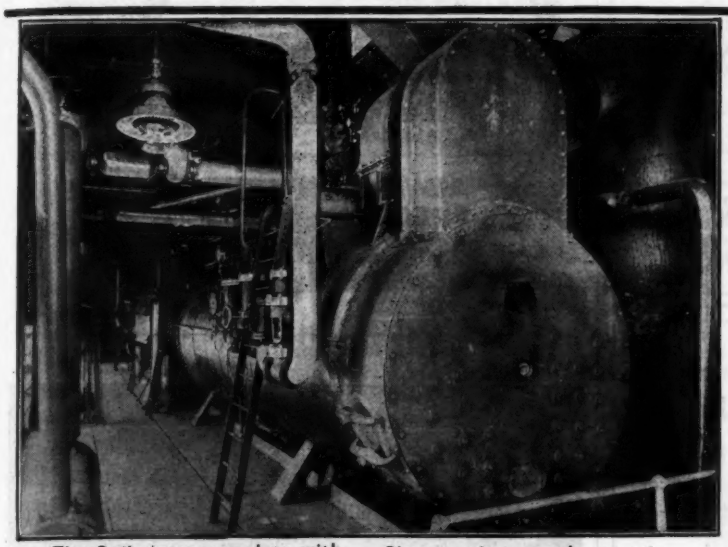

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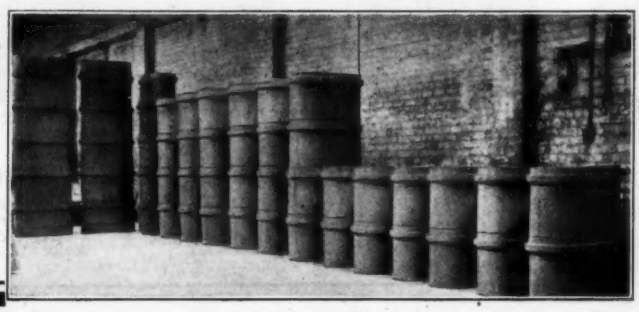

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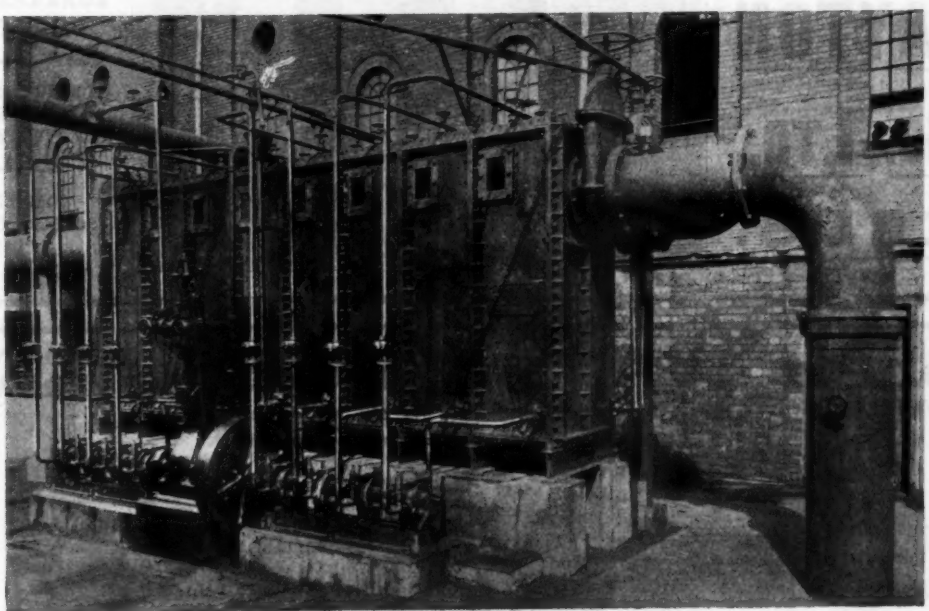

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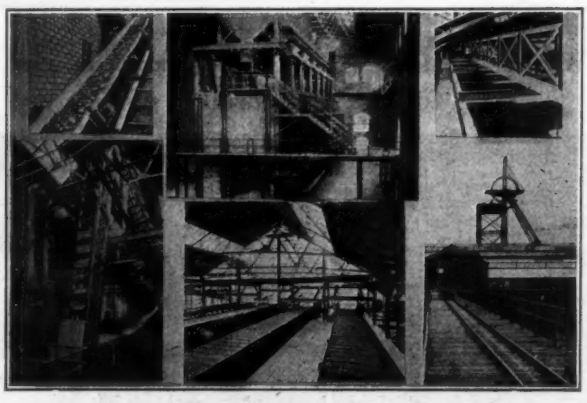

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Fig. 105

Fig. 256

Fig. 257

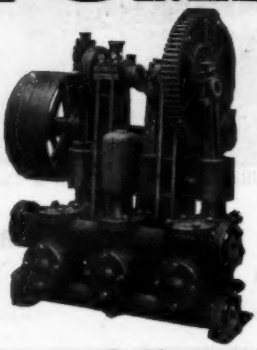

Fig. 842

Fig. 187

Fig. 69

Fig. 834

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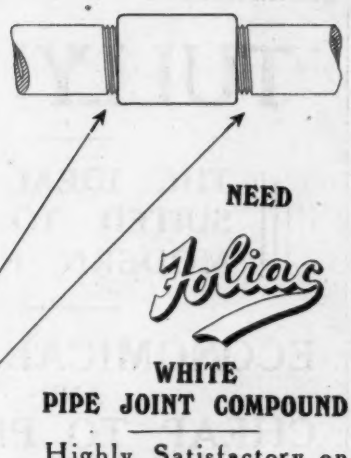

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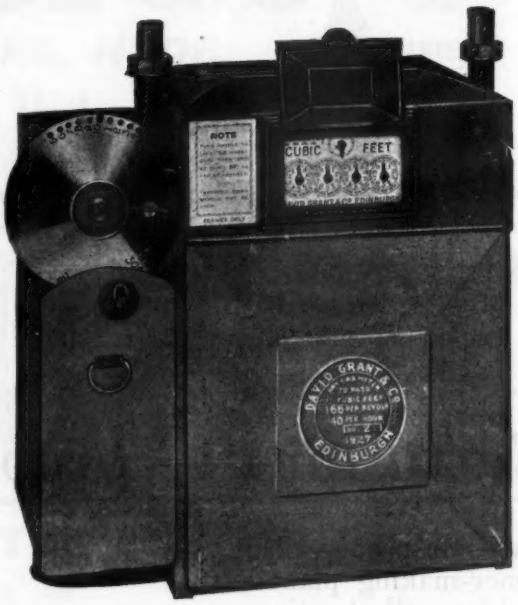

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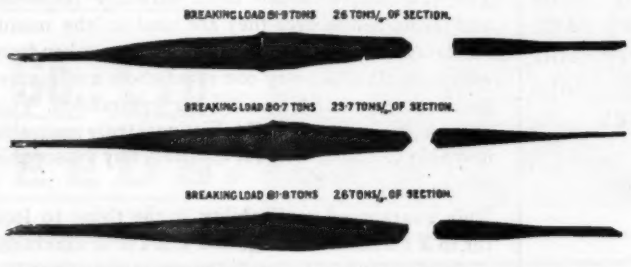
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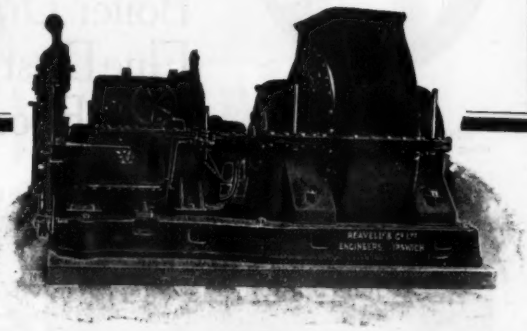

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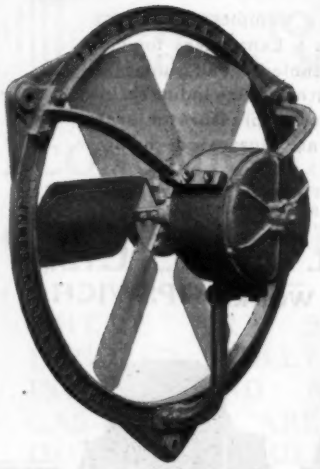

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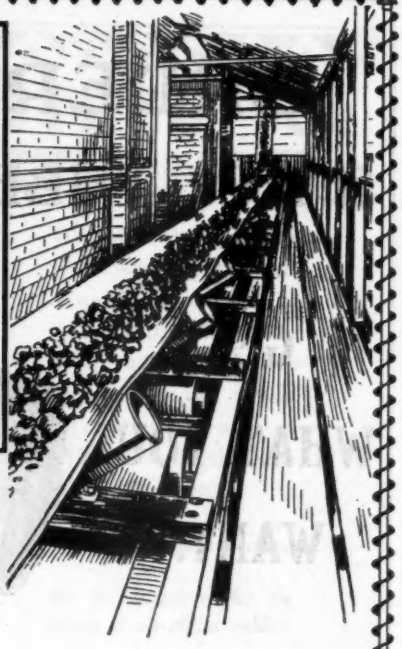

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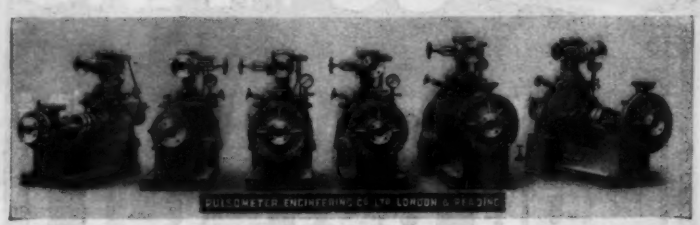

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